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MICROSCOPICAL STUDIES OF TUBAL PREGNANCY*

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WE find many conflicting statements in medical literature about the microscopic appearance of the pregnant tube. Among investigators, however, there is not much difference of opinion. The varying statements are due to a perpetuation by noninvestigators of errors made by earlier observers without a careful scrutiny of the literature for more recent investigations.

It is with the hope of clarifying some of these supposed controversial points that this material is presented. It occurred to the writer some years ago when he began collecting this material that it might be of advantage to section the tubes longitudinally rather than by the usual cross section.

The advantages of this method were conceived to be: first, in serial section studies of the whole tube there would be fewer slides (there proved to be 300 to 700 longitudinal sections and 2000 to 4000 cross sections); second, that the tubes being cut from the uterine to the fimbriated end a better opportunity for naked eye or hand glass study might be offered, showing on one slide in the central sections of each tube the condition and relations of all parts of the tube to the ovum.

IMPLANTATION OF THE OVUM

Inasmuch as the uterus and tubes are genetically identical and therefore composed of the same tissues, we might well expect the same reaction of the uterine and tubal elements to a pregnancy. Careful observations demonstrate that the physiologic scheme is followed exactly in both uterus and tube; in the latter, however, the results are pathologic from the beginning because the ovum is implanted in an organ entirely unfitted anatomically for its reception

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or development. We find in tubal pregnancy the analogues of everything occurring in an intrauterine gestation, but never the identical thing itself because of anatomic and histologic differences of the two organs, i. e., the processes are the same but the results inevitably different.

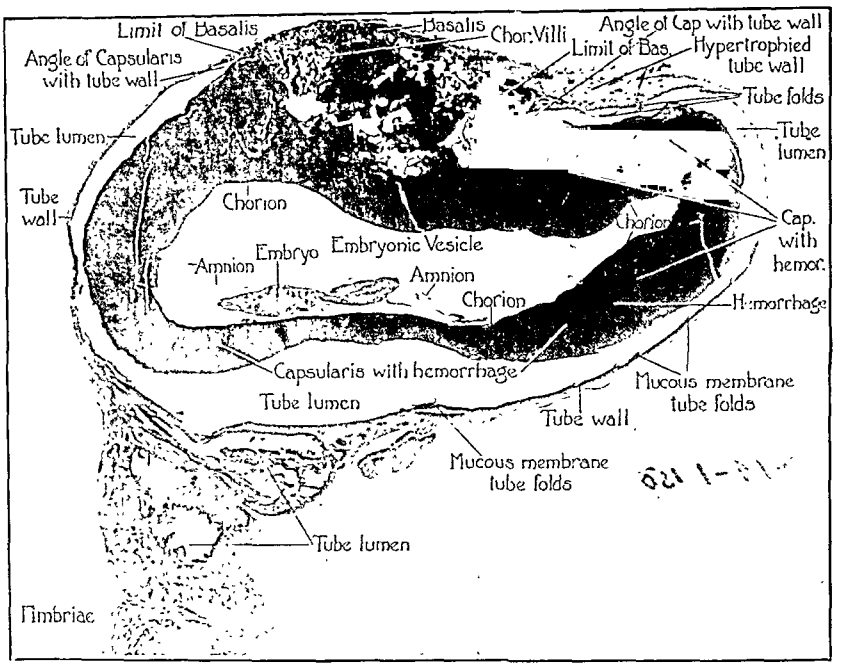

Fig. 1.—Photograph of longitudinal section of tubal pregnancy showing relations of ovum to tube; basalis (serotina) with riddled tube wall beneath it, capsularis (reflexa) distended by hemorrhage, the angles of capsularis with tube wall particularly distinct, embryonic vesicle bounded by chorion, amnion with contained embryo, hypertrophied tube wall near basalis and then distended tube wall.

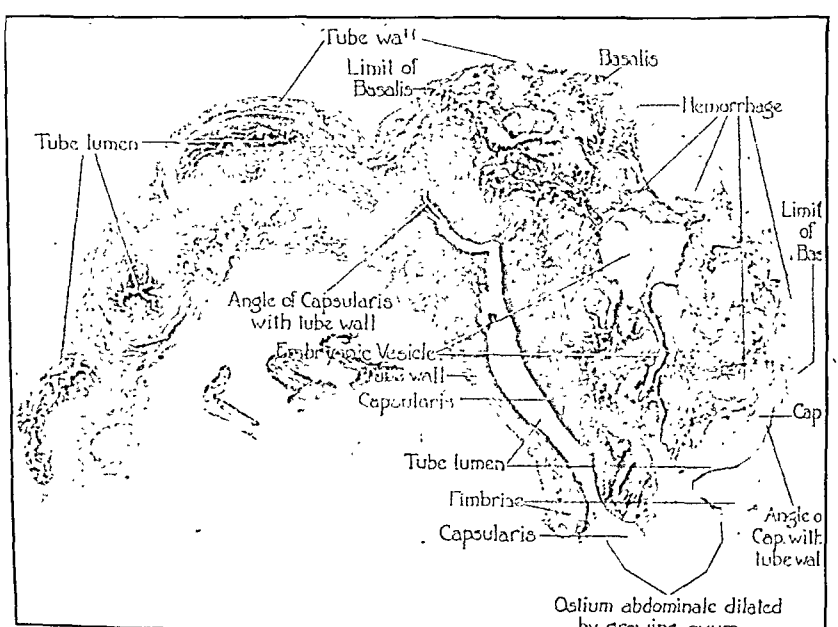

Fig. 2.—Photograph of longitudinal section of pregnant tube showing implantation near fimbriated end of tube; ovum bulging through end of tube by growth of embryo through ostium abdominale and not by tubal abortion.

Implantation occurs in exactly the same manner in both uterus and tubes; the ovum burrows into the mucous membrane in each instance, but from the moment of entrance, it meets different conditions and its further history is determined by them.

DECIDUA

In the uterus the fertilized ovum finds a mucous membrane whose stroma, either because of the greater thickness or because of specialization, is capable of developing into decidua thick enough to harbor the ovum, protect the muscle of the uterus from the arrosive action of the trophoblast, and extensive and loose enough to form the decidua capsularis.

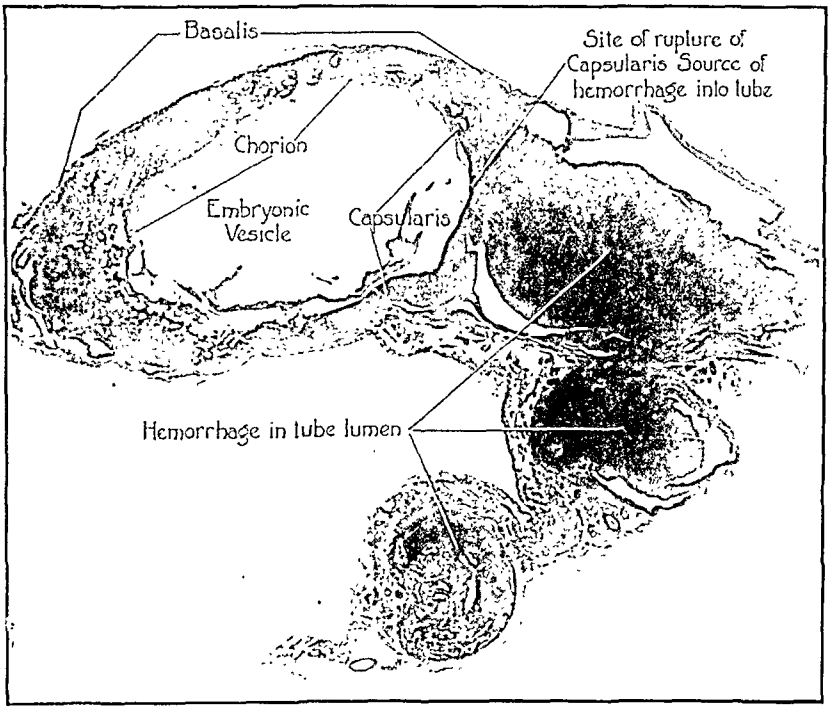

Fig. 3.—Photograph of longitudinal section of tubal pregnancy showing rupture of capsularis (inner ovum capsule) with resultant hemorrhage into tube lumen due to inner rupture not to tubal abortion.

In the tube, on the other hand, there is a scant connective tissue stroma (or specialization of the tissue is lacking) and we find no true decidua, although "decidual reaction" can be demonstrated.

In the uterus the decidua because of its important function might well be called an organ; in the tube we find no such organ but decidual cells are discernible throughout the mucous membrane of the tube either as isolated cells or in groups, but never as true decidua.

BASALIS

There has been more controversy about the presence of decidual cells in the basalis than in any other portion of the tube; some observers contending that they have never found them and others that they were always found in

abundance. This difference of opinion arises from two things; first, that decidual cells are indeed, in all cases, very scarce, requiring prolonged search. Often in serial sections they will be demonstrable only in very few slides. In this small series they have always been found but in some specimens only after laborious hunting through numerous serial sections. One cannot say there are no such cells unless he has examined every slide of serial sections of the whole tube. Second, those who claim that decidual cells are found in abundance in the basalis, are probably making the same mistake that the earlier observers made, namely, misinterpretation of trophoblast cells as decidual cells. When these cells are isolated or in groups not showing direct connection with trophoblast masses (Fig. 12), it is easy to mistake them for decidual cells. However, their trophoblastic origin can be demonstrated in slides where the

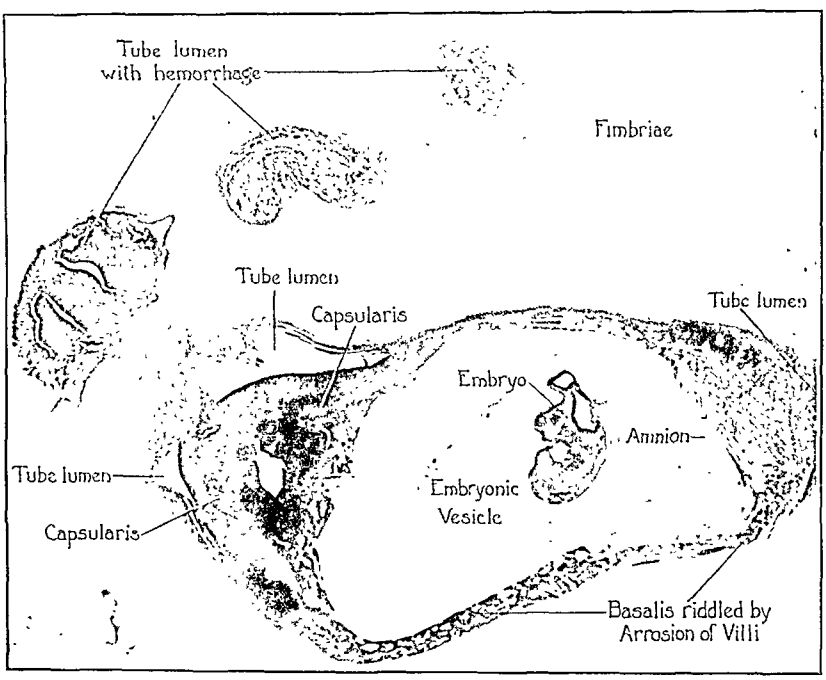

Fig. 4.—Photograph of longitudinal section of tubal pregnancy showing hemorrhage into tube lumen due to rupture of capsularis, also shows embryo in tube.

undoubted deeply stained trophoblastic mass is in direct continuation with the less deeply stained but evidently identical cells (Fig. 22).

Even though decidual cells may be found in the area usually called decidua basalis, true decidua is never present, hence we cannot, in truth, speak of decidua basalis in tubal gestation. We have the analogue but not the thing itself, therefore, for want of a better term it will simply be called "basalis." (Figs. 1, 2, 3, and 4.)

Inasmuch as there is no decidua in the basalis or what little there might have been, having been destroyed in the erosive action of the trophoblast, the ovum almost immediately after penetrating the mucous membrane comes into contact with the inner muscular layer of the tube, continues its arrosive action

on the muscle in its attempt to fasten itself and seek blood supply, thus, literally riddling the muscle and weakening the wall.

Fig. 22 shows the muscle layer in process of destruction by the trophoblast and Fig. 5 shows the villi anchored directly into the musculature of the wall and arroding it.

In the uterus the thick decidua basalis protects the muscle wall from such attack and furthermore furnishes ample area for the excavation of the sinuses or lacunæ by the trophoblast within the decidua. The vessels in the uterine

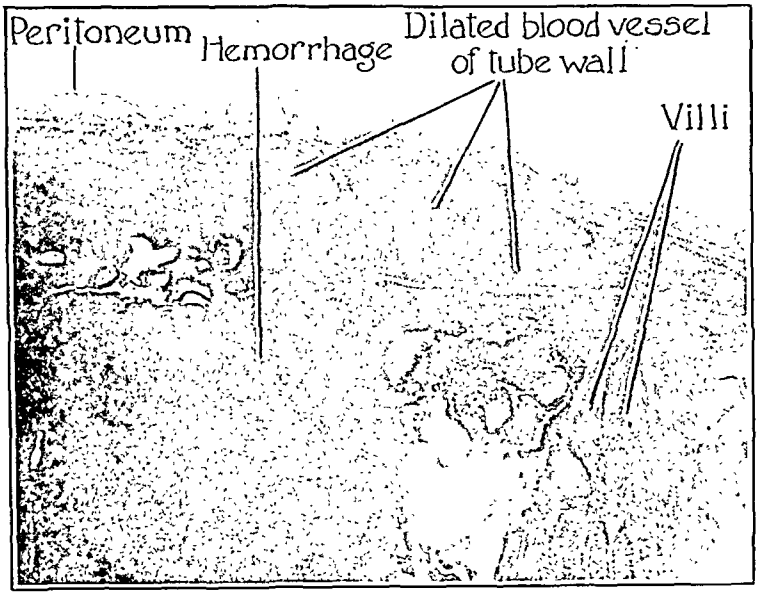

Fig. 5.—Photomicrograph showing large dilated blood vessels of tube wall, anchoring villi and hemorrhage (not an orderly circulation) into intervillous spaces.

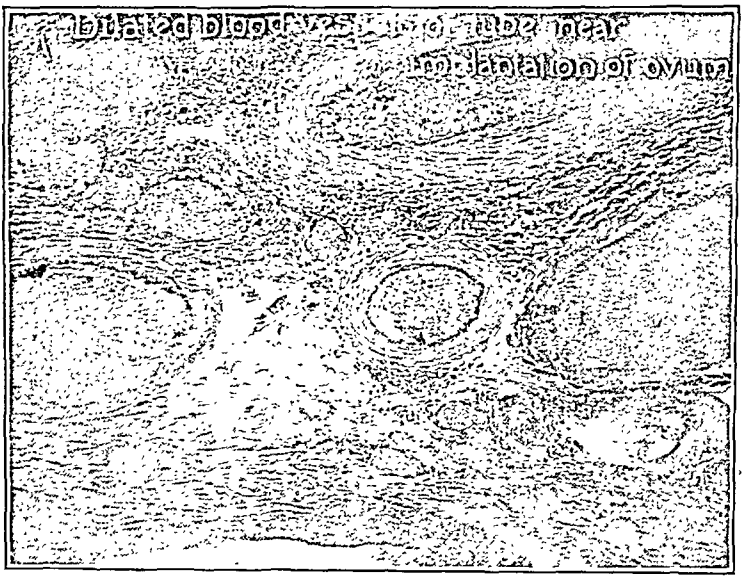

Fig. 6.—Photomicrograph showing dilated vessels of tube wall.

decidua basalis arroded to furnish the blood to the lacunæ are very small, causing not a hemorrhage but a normal blood supply to the intervillous spaces, while in the tube this protecting decidua being absent, the muscle is attacked, and the vessels arroded are much larger, thus causing a hemorrhage instead of a normal blood supply into the intervillous spaces.

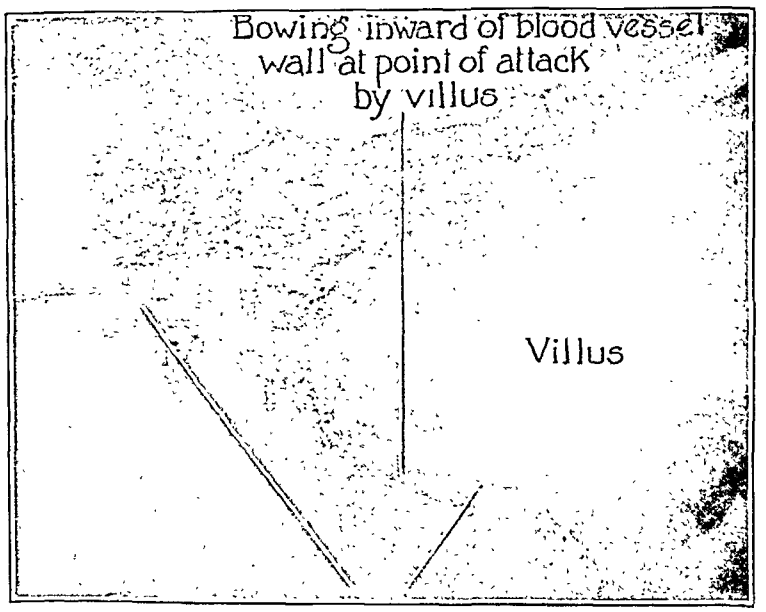

Fig. 7.—Photomicrograph showing vessel wall bending inward as if the villus attacking it were exerting mechanical pressure.

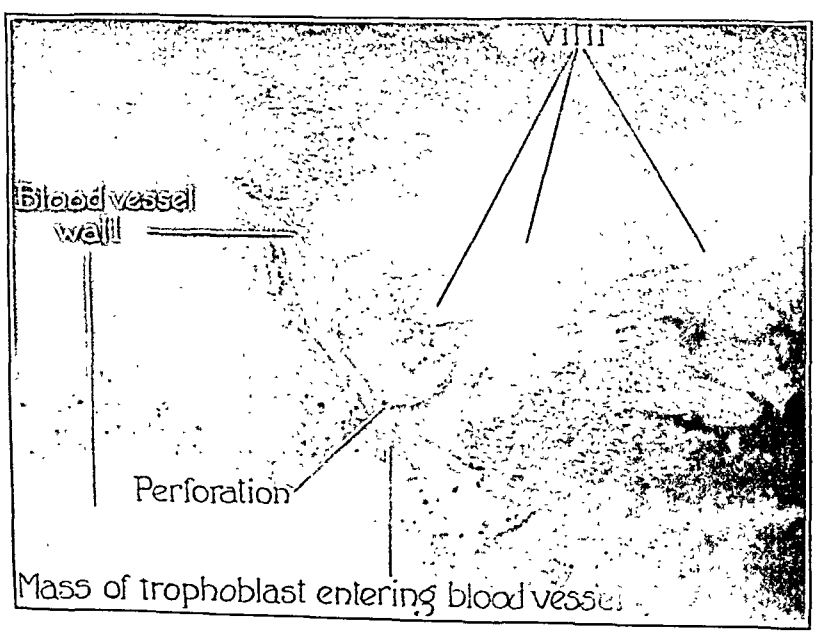

Fig. 8.—Photomicrograph showing villus in the act of arroding the vessel wall, mass of trophoblastic cells within the vessel just having completed the perforation.

The blood vessels of both the uterus and tube are dilated in the region of the implantation of the ovum, but in the uterus they are protected from the destructive action of the trophoblast by the presence of the decidua basalis so that only the smaller vessels in the decidua itself are attacked. In the tube on the other hand on account of the absence of the decidua the unprotected dilated vessels in the musculature are arroded causing a hemorrhage in the intervillous spaces instead of a normal blood supply. This hemorrhage is

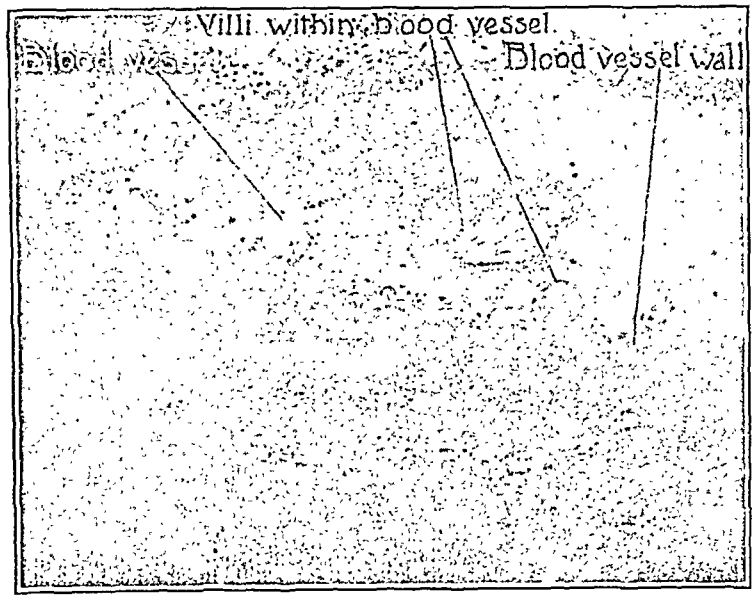

Fig. 9.—Photomicrograph showing cross sections of villi entirely within a vessel of the tube wall.

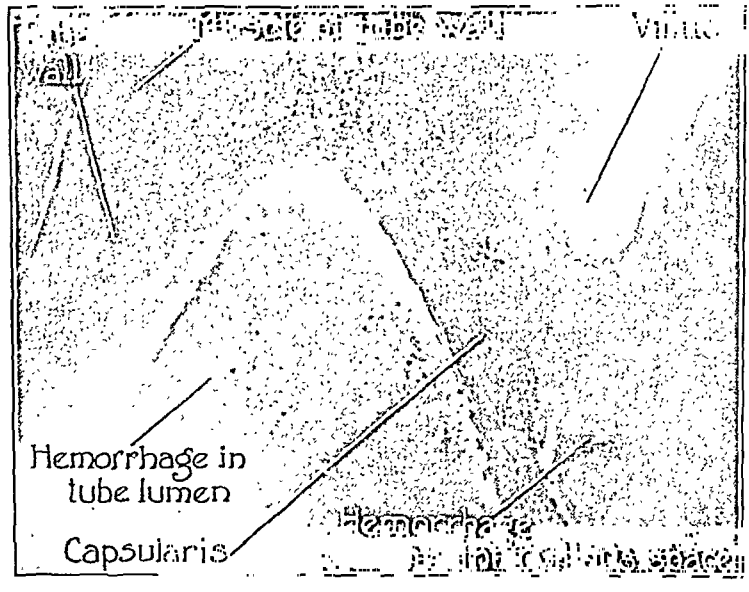

Fig. 10.—Photomicrograph showing angle of reflection of capsularis (reflexa) from tube wall, also hemorrhage in intervillous space and tubal lumen.

sometimes so profuse that the villi are displaced and crushed together and the ovum capsule is distended beyond its ability to resist and the blood bursts through into the tube lumen.

Figs. 5, 6 and 16 show the dilated vessels of the pregnant Fallopian tube in the region of the implantation.

Figs. 5, 7 and 16 show villi close to the walls of the large blood vessels;

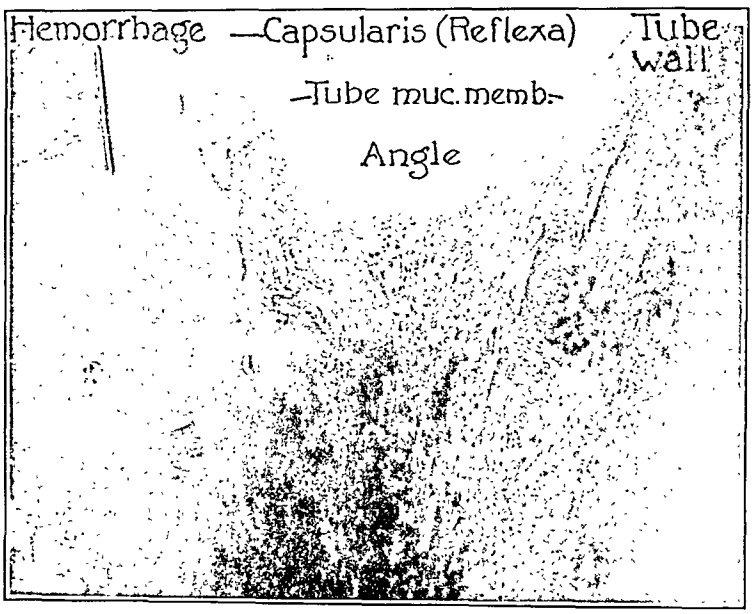

Fig. 11.—Photomicrograph showing angle of capsularis (reflexa) with tube wall and hemorrhage in intervillous spaces

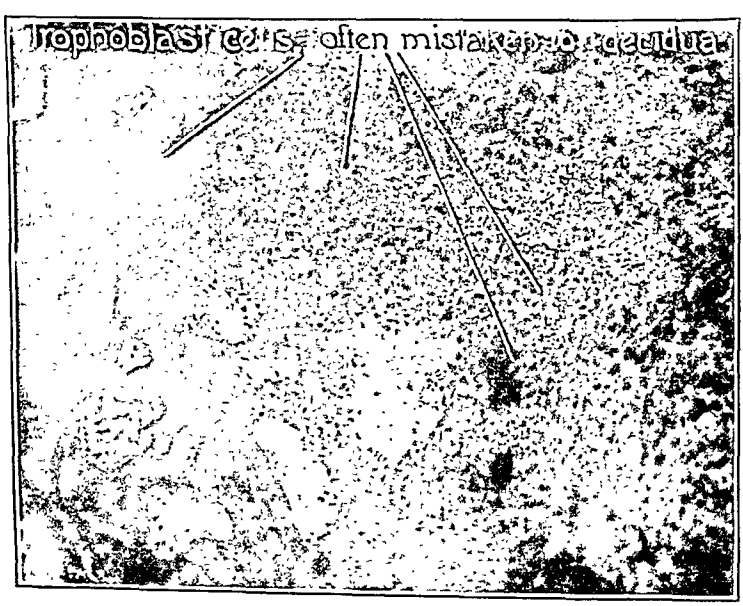

Fig. 12.—Photomicrograph showing more or less scattered trophoblastic cells frequently mistaken for decidual cells.

Fig. 18 shows the villi in the act of penetrating the vessel walls. In Figs. 8 and 18 the penetration is completed and in Figs. 14, 15 and 18 the blood flow between the vessels and intervillous spaces is completely established.

When we note the size of the vessels in Figs. 5, 6, 8, 14, 16 and 18 which may be or have been perforated by the arrosive trophoblast or villi, it is very easy to understand why we see so much hemorrhage into the intervillous

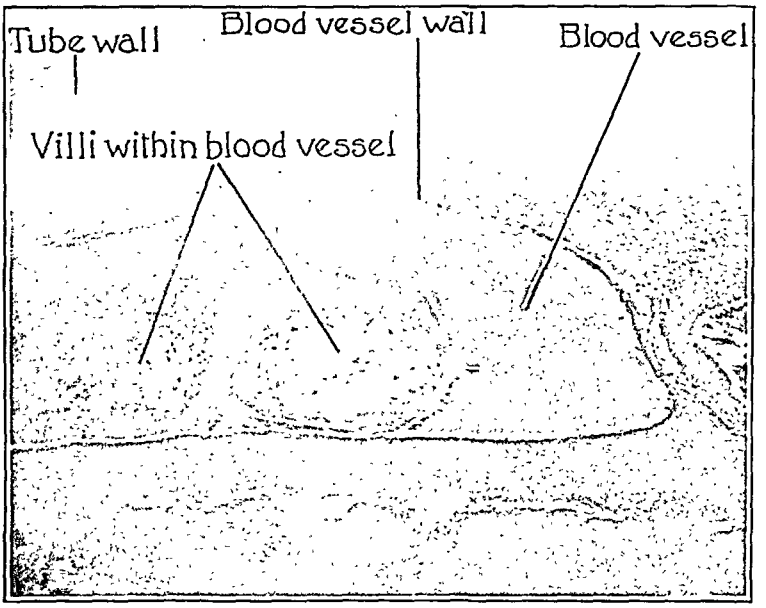

Fig. 13.—Photomicrograph (retouched) showing cross section of two large villi entirely within blood vessels of tube wall.

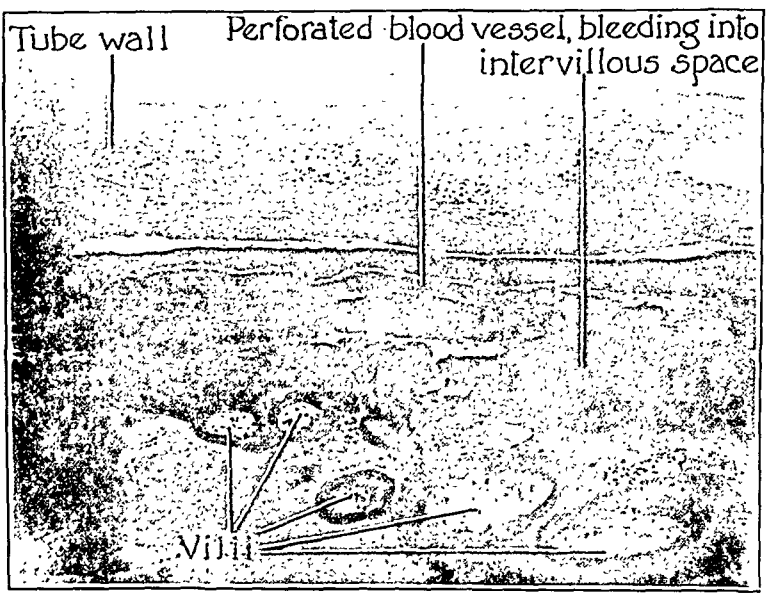

Fig. 14.—Photomicrograph (retouched) showing hemorrhage pouring from arroded blood vessel of tube wall into intervillous space.

spaces, capsularis and tube lumen. Figs. 8 and 15 show the villi distorted and crushed together by the excessive amount of blood in the intervillous spaces and Fig. 20 shows such an amount of hemorrhage that we see scarcely anything but blood, which is so excessive that it has flattened the embryonic sac so that it looks like a tube.

Webster said that in all the pregnant tubes he had examined he had never seen a capsularis without hemorrhage. The writer believes that hemorrhage is the rule.

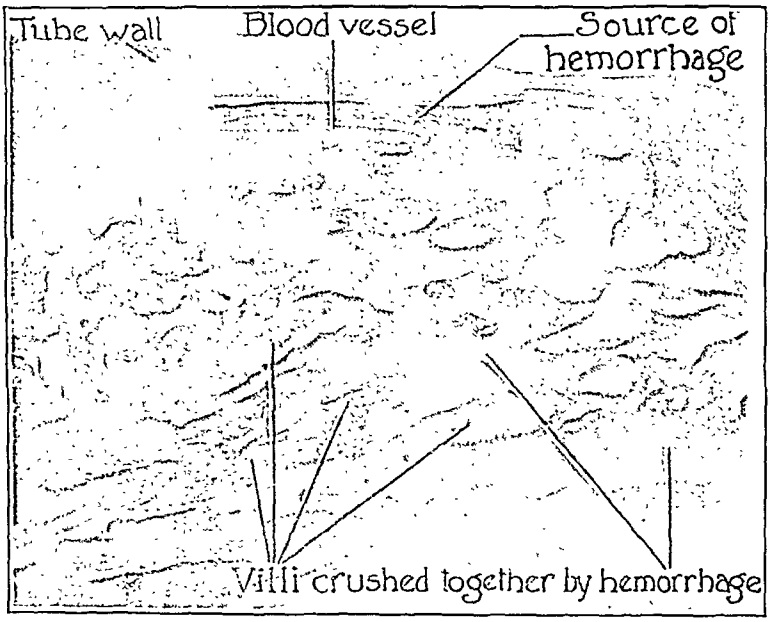

Fig. 15.—Photomicrograph (retouched) showing how the large hemorrhage of the vessel shown in Fig. 14 is crushing the villi together and destroying their normal relations to each other and to the tube wall.

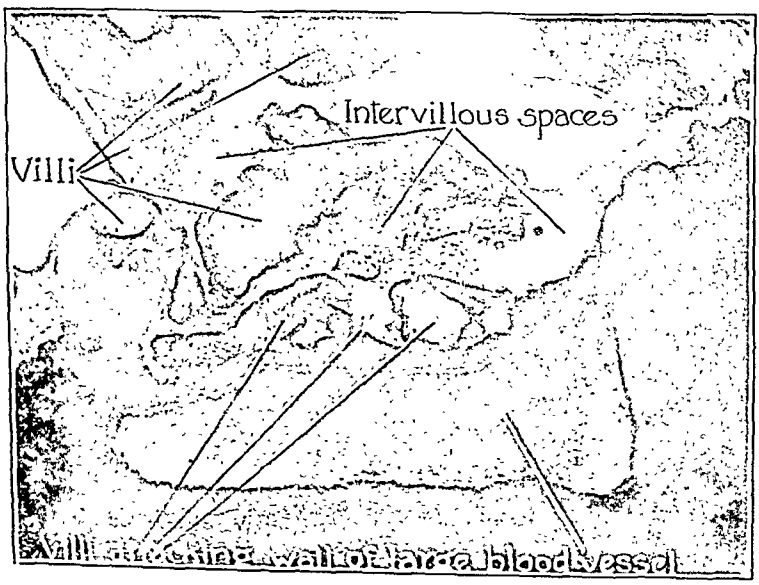

Fig. 16.—Photomicrograph showing very large vessel being attacked by villi.

Figs. 5, 8, 10, 11, 13, 14 and 15 show the excessive amount of blood in the intervillous spaces and Figs. 19 and 24 show the same condition in the capsularis, while Figs. 10 and 24 show the blood free in the tube lumen, having burst through the capsularis.

CAPSULARIS

The earlier writers said little about finding a decidua capsularis (reflexa) but von Winkel in 1871 described an ovum with a reflexa (capsularis) and Werth in 1887 described one with a maternal enveloping layer corresponding to the decidua capsularis and he was the first to describe it histologically. Zedal and many others confirmed Werth's findings, but here again the early errors appear in some writings although investigators are in substantial agreement that

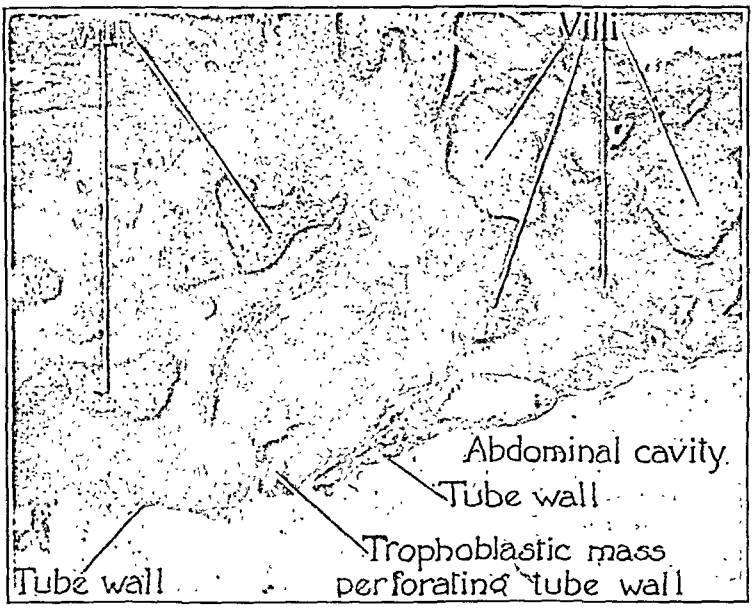

Fig. 17.—Photomicrograph showing several villi attacking tube wall and the trophoblastic cells of one having completely perforated the wall.

there is in tubal pregnancy an analogue of the decidua capsularis of intrauterine pregnancy, but here as in the basalis there is no true decidua although decidual cells and cell groups are frequently found. The writer has found them more frequently in the capsularis than in the basalis in spite of the fact that hemorrhage is universally present in the capsularis masking the cell elements.

That there is a capsularis which is the analogue of the decidua capsularis of the uterus is shown in Figs. 1, 10, 11, 19, and 24.

Mucous membrane and tube folds and other wall tissue can be demonstrated on the ovum mound projecting into the tube lumen, proving conclusively that it is truly "capsularis" notwithstanding the fact that there is so little decidual reaction that we cannot call it "decidua capsularis."

This "inner ovum capsule," as it has been well called, is inherently weak, does not expand and grow with the ovum as does the true decidua, and it is also further weakened by arroding villi just as is the tube wall, hence it ruptures easily. (Figs. 3, 4 and 24.)

DECIDUAL FORMATION IN OTHER PARTS OF THE TUBE

It really seems that the farther away from the site of implantation we get the more decidual reaction we find. We see it in distant parts of the tube, in the fimbria (Fig. 23), in the peritoneum of the tube and it has been observed even in the opposite nonpregnant tube.

MUSCULARIS TUBÆ

Werth noted thickening of the muscle of the tube outside the implantation area. This has been observed also in this series (Fig. 1); however, it is not a constant finding and has been seen only in the neighborhood of the implantation. The muscle in other parts of the tube is not greatly modified except where it is put upon the stretch by the growing ovum. (Figs. 1, 3 and 4.)

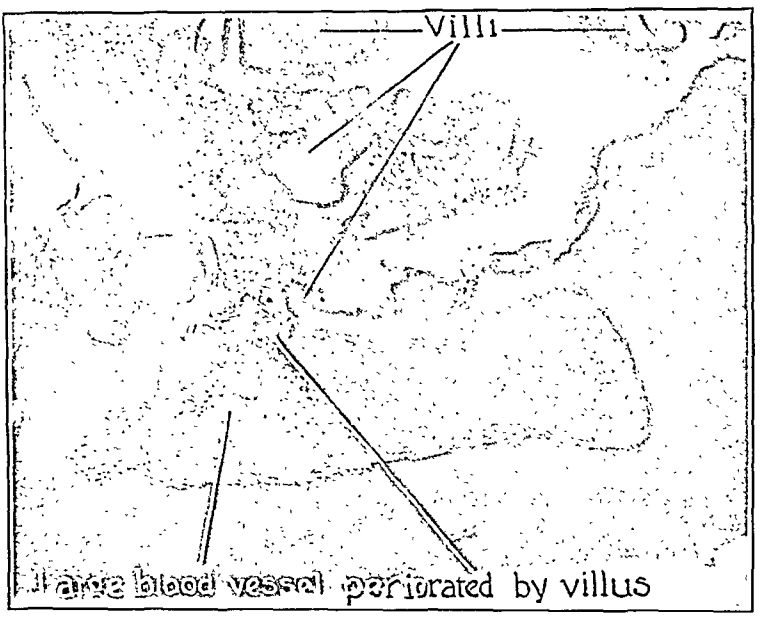

Fig. 18.—Photomicrograph showing perforation in vessel wall caused by arrosive action of villi.

RUPTURE AND ABORTION

It is usually stated that ectopic gestation is terminated by "tubal rupture" or "tubal abortion." This statement is only approximately correct for the reason that the condition called "tubal abortion" is not strictly speaking an abortion, analogous to a uterine abortion, i.e., a separation of the ovum from its attachment and extrusion by the activity of the musculature of the tube. Separation does sometimes occeur and the ovum may be found free in the tube lumen, but that this is the rule in the so-called tubal abortion or that the tube has power to expel the separated ovum, is very doubtful.

The fact that the ovum of an extra-uterine pregnancy is frequently found protruding through the ostium abdominale of the tube is not usually due to an expulsion of a separated ovum by the tube, but is generally due to the fact that in

such cases the implantation of the ovum has occurred near the fimbriated extremity. The ovum is protruding, not because it is separated and being expelled, but because it is pushing through the end of the tube by virtue of its own growth and enlargement. This slowly dilates the abdominal opening of the tube and the ovum is not separated from the original site of implantation. This is illustrated by Fig. 2, in which the ovum is seen implanted near the ostium abdominale, is not separated or ruptured, but is protruding from the end and

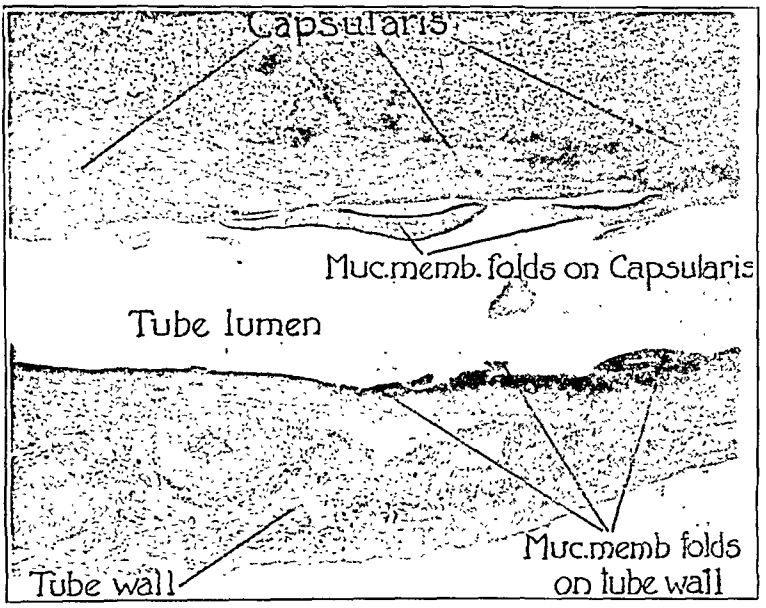

Fig. 19.—Photomicrograph showing tube wall and caspularis opposite covered by tubal mucous membrane proving conclusively the existence of a capsularis (reflexa) in tubal pregnancy.

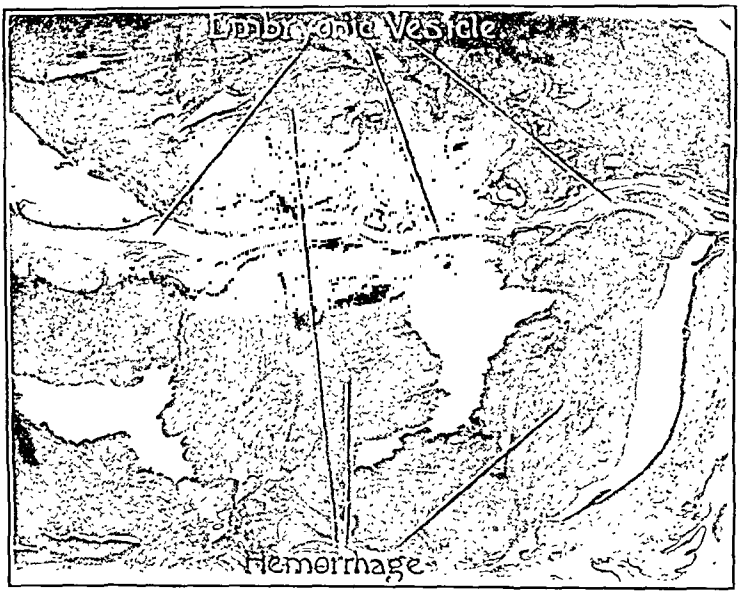

Fig. 20.—Photomicrograph showing hemorrhage in capsularis which is so massive that it has flattened the embryonic vessel so that it looks like a tube.

dilating the opening by its own increase in size. By strict interpretation of terms this could hardly be called an abortion.

Of course, in this particular specimen, there is a tremendous intraovular hemorrhage and the embryo is pathologic. The embryonic sac was compressed by the hemorrhage into the tube-like body (Figs. 2 and 20) but by looking at this picture it seems logical to assume that in a case where the ovum did not perish it could continue its growth through the end of the tube, retain its attachment to the original site of implantation, increase the placental

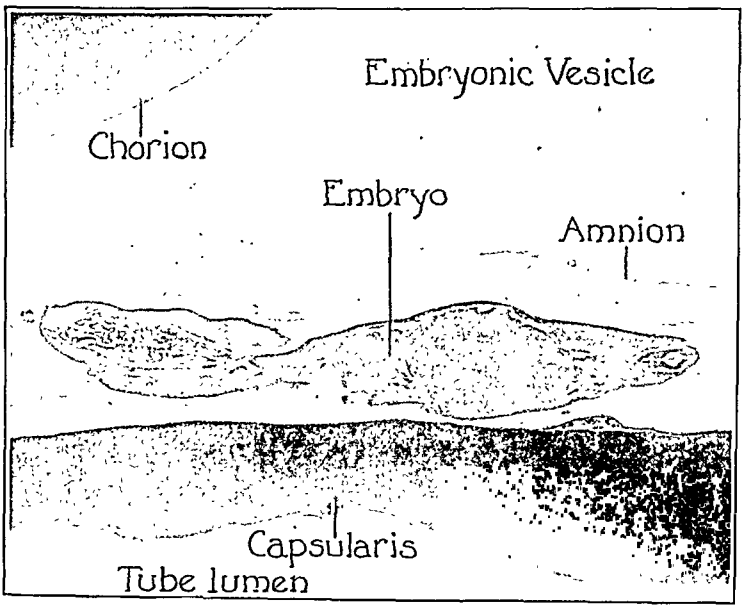

Fig. 21.—Photomicrograph showing details of embryo.

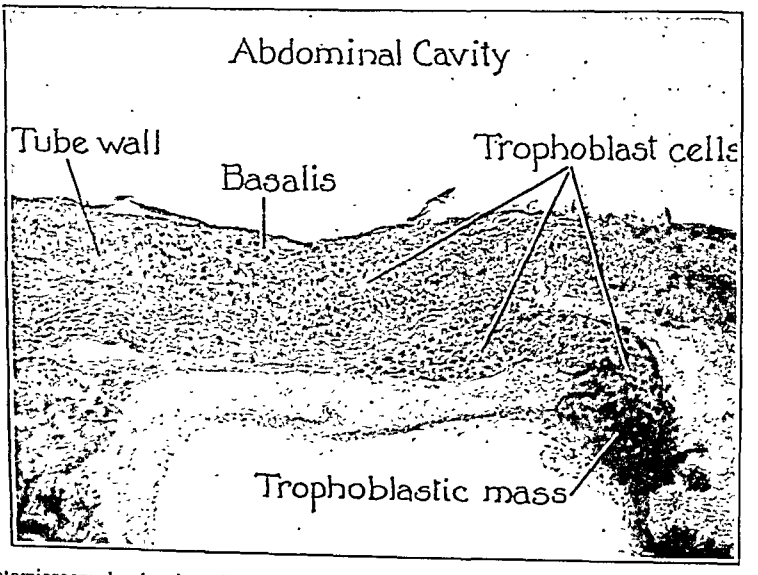

Fig. 22.—Photomicrograph showing dense trophoblastic cell mass gradually fading out to isolated cells which are often mistaken for decidual cells.

area in the same manner as in the uterus, extending simply by continuity over the surface of the broad ligament and adjacent pelvic structures and an abdominal pregnancy result. It is the writer's opinion that this is a logical explanation of some cases of abdominal pregnancy, for he cannot believe that such a condition can occur by reattachment of a separated ovum. Moreover, it seems rather doubtful that an abdominal pregnancy can follow a rupture through the tube wall and there is doubt that an ovum can primarily implant itself in the peritoneum.

If the implantation is nearer the uterine end of the tube the termination will be either "external rupture" of the ovum capsule through the tube wall into the abdominal cavity or "internal rupture" through the inner ovum capsule into the tube lumen or, rarely, separation of the ovum, in which case it perishes and may become a tube mole or it may be pushed along toward the

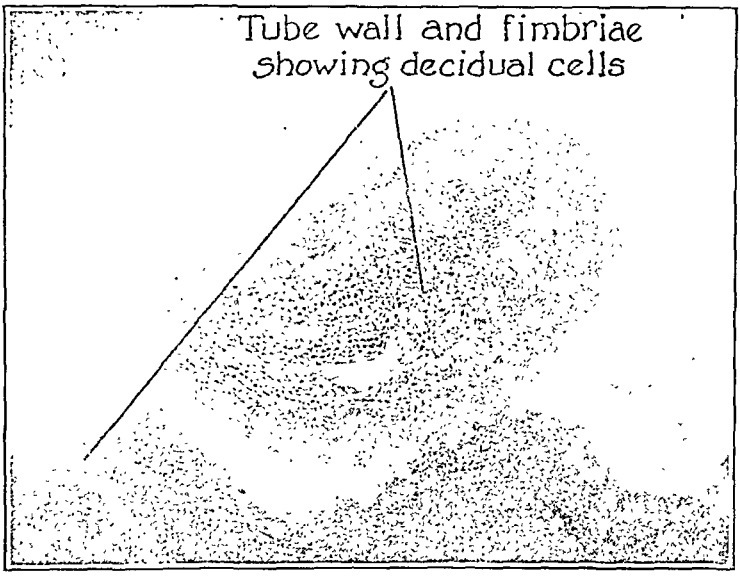

Fig. 23.—Photomicrograph of fimbriated fold showing decidual cells, illustrating the fact that the farther we get from the site of implantation, the more decidual reaction is found.

fimbriated end by the hemorrhage but not by the tube muscle. True abortion is rare in the writer's opinion. "Internal rupture" is a better term than "tubal abortion" for, although in a great majority of so-called unruptured tubes, hemorrhage into the tube and from the ostium abdominale is the rule, it is not always due to separation of the ovum, as in uterine abortion. On the contrary it is more often due to a rupture of the internal ovum capsule caused by distention of the ovum capsule by the hemorrhage explained above and by a weakening of the capsularis by the arrosive action of the villi. Fig. 1 shows the capsularis distended with blood and Fig. 3 shows the rupture of the capsularis or internal capsule and the blood escaping into the tube lumen and flowing toward the fimbriated end. In all of these illustrations the ovum is not separated from the tube wall.

"External rupture" may be either a true bursting of the weakened arroded tube wall under pressure from within, due to the growth of the ovum or distention by hemorrhage, or it may be only an arrosion by villi, the wound being very small and yet it may terminate fatally because a large vessel has been opened.

Fig. 17 shows trophoblastic mass having perforated the tube wall and Fig. 1, 2, 3, and 4 show how the tubal wall has been "riddled" and weakened by the erosive action of the villi.

It is easy to understand how such a weakened wall can rupture. Werth observed that when trophoblastic masses or villi come in contact with the vessel which it is to perforate there is a bowing inward of the wall toward the lumen of the vessel just as if it were under mechanical pressure. This is well

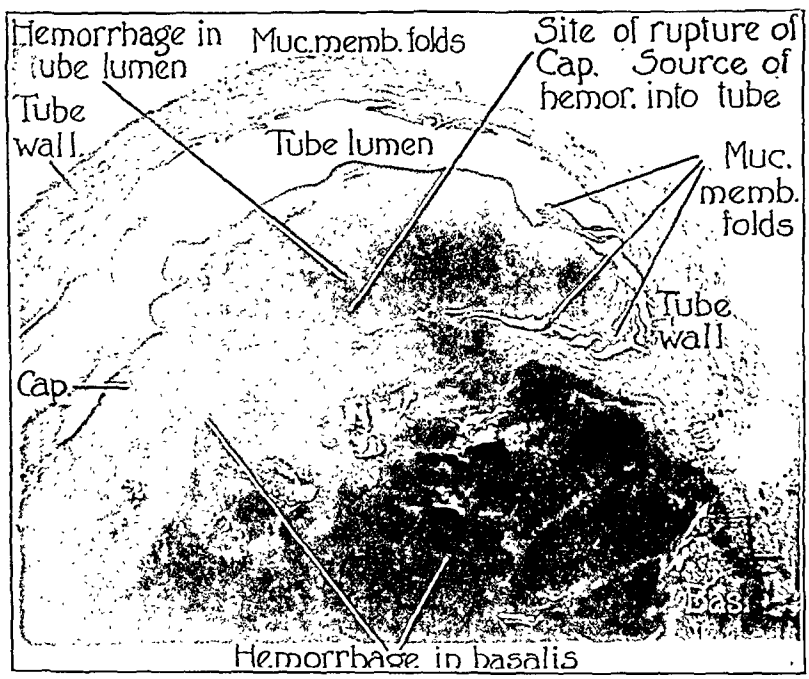

Fig. 24.—Photomicrograph showing angle between tube wall and capsularis (reflexa), mucous membrane of tube wall reflected for some distance on capsularis; shows also massive hemorrhage into intervillous spaces site of rupture of capsularis (internal ovum capsule) and hemorrhage through rupture into tube lumen.

shown in Fig. 7. Not only are masses of trophoblastic cells seen just within the vessel wall after perforation (Fig. 8) but sometimes larger masses or even whole villi are observed in the vessel, perhaps having been swept in by the blood stream from the intervillous spaces. Figs. 9 and 13 show cross sections of villi entirely within the vessel.

Time will not permit detailed description of the embryos found in this series, therefore, I will without discussion call your attention to Figs. 1, 4, 20 and 21 in which the embryos are shown *in situ*.

In conclusion, without attempting to enumerate the specific points, it may be said that every physiologic process occurring in intrauterine pregnancy is repeated in tubal gestation but from the moment after the ovum has penetrated the mucous membrane of the tube every detail is pathologic.

REFERENCES

Cornil and Weinberg: Anatomie et Histologie grossesse tubaire, Rev. de gynéc., 1901, p. 713.
Abel: Zur Anatomie der Eileiterschwangerschaft. Arch. f. Gynäk., xxxix, 393.
Backmann: Die Beziehungen der tubaren Placenta zum Tubenabort und zur Tubenruptur, Arch. f. Gynäk., lx, 523.
Saenger: Zur Deciduabildung in der Tube, Ztschr. f. Geburtsh. u. Gynäk., xxxiii, 372.
Webster: Ectopic Pregnancy, Macmillan Co., 1895.
Zweifel: Zur Eieinbettung, Deutsch., med. Wchnschr., 1892, p. 211.
Zedel: Zur Anatomie der schwangeren Tube, Ztschr. f. Geburtsh. u. Gynäk., xxvi, Part 1.
Füth: Demonstration eines Praeparates von Tubenschwangerschaft, Zentralb. f. Gynäk., 1901, p. 306.
Koenig: Ibid., p. 307.
Kreisch: Beitrag. zur Anatomie u. Pathologie der Tubengraviditaet, Monatschr. f. Geburtsh. u. Gynäk., 1897, ix, 794.
Werth: von Winkels Handbuch der Geburtschilfe, ii, part 2, p. 655.
Aschoff: Centralb. f. Allg. Path. u. path. Anatomie, 1901, xii.
Kossmann: Zur Histologie der extrauterinen Schwangerschaft, Ztschr. f. Geburtsh. u. Gynäk., xxvii, 266.
Cornie: Sur l'anatomie et histologie de la grossesse tubaire, Rev. de Gynec., iv, 3.
Veit: Ueber Deportation von Chorionzotten, Ztschr. f. Geburtsh. u. Gynäk., xliv, 465.
Kroemer: Untersuchungen ueber die tubare Eieinbettung, Arch. f. Gynäk., lxviii, part 1.
Orthmann: Ueber Tubenschwangerschaften in den ersten Monaten, Ztschr. f. Geburtsh. u. Gynäk., xx, 143.
Gunser: Ueber einen Fall von Tubenschwangerschaft Centralb. f. Allg. Path., 1891, p. 6.
Fromml: Zur Therapie und Anatomie der Tubenschwangerschaft, Deutsch. Arch. f. klin. Med., 1888, xlii.
Dixson, Jones: Development of the Placenta in Tubal Gestation, Am. Jour. Obst., xxvii, 350.
Kenoshita: Monatschr. f. Geburtsh. u. Gynäk., viii, 500.
Josefson: Deciduo-cellulaire Vegetation in Peritoneum, Nord. Med. Ark., xxxi, No. 28.
Frankl, Oscar: Kurzgefasstes Handbuch du gesammten Frauenheilkunde, Vol. II, Pathologische Anatomie und Histologie der weiblichen Genital Organe, p. 164.
Alban, Doran: London Obst., Soc. Tr., xl.
Bandler: Am. Jour. Obst., 1902.
Bland-Sutton: Lancet, London, 1897.
Bozeman: Am. Gynec. Jour., xiii.
Braxton Hicks: London Obst. Soc. Trans., ix.
Edge: Brit. Gyn. Jour., 1905.
Outerbridge: American Journal of Obst., 1912.
Scott: Amer. Jour. of Obst., 1911.
Horsley, Shelton: Med. Rec., 1913.
Stark: Brit. Med. Jour., 1907.
Taussig: Surg. Gynec. and Obst., 1906.
Taylor: Extrauterine Pregnancy, London, 1899.
Griffiths: Gestation in the Fallopian Tube and Structural Changes That Take Place in the Walls, Jour. Path., v, 443.
Russell: On the Anatomy of the Pregnant Tube, Jour. Obst. and Gynec., British Empire, iii, 419.

DONALDSON BUILDING

(*For discussion, see p.* 302.)

HEMORRHAGES INTO THE PELVIC CAVITY OTHER THAN THOSE OF ECTOPIC PREGNANCY*

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THAT ectopic pregnancy is the most frequent cause of hemorrhage into the pelvic cavity is a well-established fact. That there may be, however, other causes for such hemorrhage is something which every surgeon of wide experience has had occasion to learn. A considerable literature likewise affords testimony to the same. An experience with a case of hemorrhage from a ruptured Graafian follicle and several instances in which blood was found in the pelvic cavity, have led me to seek further enlightenment from the literature. It is the result of this investigation that I shall attempt to sum up for you. First, however, I wish to cite the case referred to.

A. L., single, aged twenty-four, gave the following history: As an infant she had rickets and did not walk until she was three and a half years old. From that time on she was robust until four years ago, at which time she had some acute illness of uncertain nature, lasting a week, during which she lost many pounds in weight. She has been below par physically since that time. During the past two years she has had occasional attacks of vomiting (usually one or two hours after eating), lasting altogether from one to three weeks. Shortly after the illness mentioned above she had an attack of pain and soreness in the right side, which lasted about a week. Two years later a similar attack.

Present attack began six hours before operation, with severe acute abdominal pain, which radiated through to the rectum. This pain was so severe that she was "all doubled up" as she expressed it, and perspired freely. The acute attack lasted about an hour and then gradually eased off. She was seen about two hours after the onset. There was some tenderness over the lower abdomen, with the principal point low down on the right side. There was no distinct rigidity but the cutaneous reflex was absent in the right lower quadrant. By rectal examination great tenderness was found in the right culdesac. Pulse and temperature were not disturbed. With the history of previous attacks and the present history and findings, a diagnosis of acute appendicitis was made, and operation advised.

On opening the abdomen through an appendiceal incision a small amount of sanguinous-fluid escaped. The appendix, which we had supposed was directed down into the pelvis, lay to the outer side of the cecum, extending well up toward the kidney. It was kinked and bound down by adhesions, but there was no sign of recent trouble. It was freed and removed. Further examination revealed blood coming from the pelvis. Since a more thorough examination was necessary, a median incision was made and the pelvis examined. The uterus was normal in size and position. Both tubes and the left ovary were normal. The right ovary was as large as a walnut and presented a ruptured Graafian follicle the size of a hickory nut, which had evidently been the source of the bleeding. There were about two or three ounces of fresh blood. The follicle was dissected from the ovary and the edges united. Patient made a good recovery.

Dr. Warthin (pathologist) of Ann Arbor reported that the specimen "shows only a normal hemorrhagic follicle, with early development of the corpus luteum,

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nothing pathologic. We have had similar cases thought to be ectopic and showing nothing more."

Dr. Warthin in further correspondence says that since 1895 he has had five similar cases in the diagnostic service of the Pathologic Laboratory of the University of Michigan. Complete histories of the cases were not then available, but in all the condition has been thought to be ectopic gestation. Two of these women were unmarried, had exposed themselves to the danger of conception; in the other cases there was also a fear of pregnancy. The patients were all young women, one or two periods had been missed, there was nervous excitement and worry, and then symptoms suggesting ectopic pregnancy. Large, apparently normal hemorrhagic follicles were found, with amounts of blood varying from several teaspoonfuls to several tablespoonfuls in the cavity. Histologic examination showed no evidences of pregnancy. Dr. Warthin's experience with the condition is interesting as showing the relative rareness of the condition and the suggestion that mental excitement and worry may sometimes have some relation to it..

The number of such cases found in the literature is a considerable one. Cases very similar to mine are reported by Adams,[1] Bartelo,[3] Bender, and Marcel,[5] Benthin,[6] Bertkrau,[7] Bonneau,[11] Bookman,[10] Boveé,[8] Cranwell,[13] Edgard,[15] Engstrom,[16] Forssner, [18] Hind,[21] Kober,[23] Ladinski,[25] Lee,[26] Lockyear,[29] Luken,[30] Novak,[34] Ohman,[36] Pfeilsticker,[37] Primrose,[39] Roll,[40] Romme,[41] Simonds,[44] Tartansen,[45] Taylor,[46] and Winiwarter.[52]

Dr. F. C. Warnshuis has kindly furnished me with the report of a case of this kind coming under his observation.

M. K., school girl, aged fourteen, had had the usual diseases of childhood but no serious illnesses. Menstruation beginning at the age of twelve, had been regular, occurring every 28 to 30 days, and in every way normal. She was a well-developed girl and had the appearance of seventeen years. Her present illness began November 27, 1913. While at school she stated that she had cramps in the abdomen. She came home complaining of abdominal pain and nausea. After reaching home she vomited. Her symptoms increased and Dr. Warnshuis saw her about nine-thirty that night in consultation.

The abdomen was everywhere tender, but extremely so in the right lower quadrant, and there was slight distention. By the rectum a great deal of pain was elicited by pressure in the right culdesac, and there was a certain amount of bogginess. There was a very slight bloody discharge. Temperature 98° F., pulse 110. A clinical diagnosis of acute appendicitis was made, but because of having had a somewhat similar case two weeks before (see bibliography) a ruptured Graafian follicle was thought of. Operation was advised and carried out that night.

Right rectus incision. On opening the peritoneum blood was discovered in considerable quantities. The right tube and ovary were brought up. The latter was ruptured and an active hemorrhage was taking place. The ovary was removed. The appendix was normal. Abdomen cleansed of blood and closed. Pulse at close of operation 136, but condition was otherwise good. She made an uneventful recovery. Pathologic diagnosis of ruptured follicle, no decidual or placental tissue.

The histories of these cases read very much alike. They have occurred usually (though not always) in young women, just before, during, or just after menstruation. The diagnosis has either been acute appendicitis or rup-

tured ectopic pregnancy, and the real condition has not been learned until the abdomen was opened. A ruptured Graafian follicle has been found as the only source of hemorrhage. The loss of blood has varied considerably, in a few instances it has been large enough to cause very serious symptoms. The pathologic report has shown no change in the blood vessels, or anything to distinguish the ovary or follicle from the normal. It is not difficult to conceive that if one had this possibility in mind a more or less positive diagnosis might be made before operation. Such an attack occurring about the time of a menstrual period in an unmarried woman might lead one to at least suspect that the case was one of ruptured Graafian follicle. If the symptoms were mild one might even defer operation under careful watching. However, at the present time operation would seem to be the safer plan, both because of the uncertainties of diagnosis and the possibilities of continued hemorrhage. I think these cases of acute hemorrhage from a ruptured Graafian follicle or corpus luteum should be grouped by themselves, because they are apparently not caused by any pathologic condition of the ovary or pelvic organs, and because they are emergencies which call for immediate clinical attention and usually operation.

Two variations from the usual severe Graafian follicle bleeding should be mentioned. One occurs in hemophilic subjects. An interesting case of this kind has been published by Warnshuis.[49]

The patient was a girl of seventeen who gave a history of having had an attack of appendicitis one year previously. At this time she had apparently been very ill. Menstruation had been regular but attended with some pain and clots. The family history was negative as regards hemophilia. On January twelfth, 1912, while attending school, she was seized with severe pain in the abdomen and some nausea, but no faintness or dizziness.

When seen later there was general abdominal tenderness, but more marked in the right lower quadrant and there was muscular rigidity. This with the history of pain and nausea made acute appendicitis a probable diagnosis, and she was accordingly operated at once. At the time of her operation her pulse was 84, temperature 99.4° F.

Upon opening the peritoneum there was a gush of fresh red blood and clots. The right tube and ovary were normal, the left ovary was ruptured and was removed. An appendix (surrounded by adhesions) which had evidently been the seat of a former appendicitis was removed. Pulse at the close of operation 140.

Pathologic report: "ovary was normal in size. There is a ruptured follicle. There were multiple hematomas but no decidual cells."

On the third day the patient had a severe nasal hemorrhage, controlled by packing the nostrils. The morning of the eighth day the nurse reported that her dressings were soaked with blood. Investigation showed that the blood had come from the lower end of the abdominal wound. The hemorrhage continued and she was taken to the operating room. The wound was reopened under local anesthesia down to the peritoneum. There was marked capillary oozing, and a small artery was bleeding in the right rectus. This was tied. Patient died that night.

Another variation worthy of note is a case of hemorrhage which occurred from a corpus luteum after operation. The case is reported by Ferguson.[17]

The patient was thirty-seven years of age and suffered from a fibroid. He did a supravaginal hysterectomy, the operation being a simple one. Both ovaries and tubes were left behind, as they were quite healthy. At the time of the operation a large corpus luteum was noticed on the surface of the right ovary, and attention was called to it merely as a point of interest. The operation was done in the morning at nine-thirty, the patient leaving the table in good condition. At five that afternoon the nurse noticed that the patient looked rather pale. At eight-thirty that evening the pulse had risen to 130, was very weak, and there were marked signs of hemorrhage.

The wound was re-opened under anesthesia and a large quantity of clotted and fluid blood found in the abdominal cavity. After clearing the field Dr. Ferguson made an examination of the pelvis and found that the hemorrhage had occurred from the corpus luteum seen at operation. The appendage was removed and the patient recovered. The case is of unusual interest, showing the possibilities of hemorrhage from this source after hysterectomy with retention of the ovaries, the operation as it is commonly performed today. One might hesitate in the light of his experience to leave uncared for an ovary with a large corpus luteum in it.

Excluding tubal pregnancy, there can be no question but that the ovaries more frequently give rise to intraperitoneal bleeding than any other of the pelvic organs or structures. There is apparently a good reason for this. They have little firmness, their blood supply is large, and in a constant state of morphologic and functional change from puberty to menopause. There is menstruation each month and ovulation with extrusion of the ovum. At this time the follicle fills with blood. At menstrual times the pelvic organs are congested, and to a lesser degree during coitus. Displacements of the organ or large tumors in the pelvis are apt to cause blocking of the return circulation and thus hemorrhage from the ovaries is favored.

These explanations are not altogether satisfactory when applied to individual cases. The real cause of the hemorrhage in most instances remains unexplained. We are in doubt as to the cause and we are often equally so in regard to the exact origin of many hemorrhages and the sequence of events that produce this condition. One needs only to read the pathologic reports to confirm this. There seems but little unanimity of opinion as to the starting point. Once a hematoma has formed in the ovary, the pressure causes absorption and distortion of the delicate surrounding tissues, and makes it difficult or impossible to understand the condition in detail.

Clinically we may perhaps divide the cases of ovarian hemorrhage into three groups—first, those due to rupture of the normal Graafian follicle or corpus luteum; second, those occurring from a condition known as hematoma ovarii; and third, those occurring in ovarian cysts (or solid tumors). Although perhaps each case cannot always be so definitely classified, this offers on the whole I believe a convenient clinical grouping. I have already discussed the first group. Of the second—that of hematoma ovarii, the following case is a good instance.

M. N., aged twenty-four, student. Of enteroptotic type and poorly nourished. Has a goiter with slight toxic symptoms. A question in the case as to an earlier tuberculosis of the lungs, although there are no signs apparent to ordinary examination. Has always had severe dysmenorrhea, compelling her to go to bed for a day or two. She has some bladder irritability and con-

siderable vaginal discharge at times. The uterus was retroverted and fixed, and there was a soft, fixed mass in the left culdesac. On opening the abdomen the first thing that attracted attention was a little free bloody fluid in the culdesac. The omentum had evidently absorbed some of this, for it was dark with blood. The left ovary was the size of a lemon and adherent. It was released with the uterus. Both tubes were normal, and the right ovary, although resembling somewhat in appearance the left, was normal in size and free of adhesions. On releasing the left ovary a quantity of chocolate colored fluid escaped. There were numerous small cysts (follicles) in the ovary containing dark material. The appendix was entirely normal. The ovary was removed, leaving the right one, and correcting the displacement of the uterus by an intramural shortening. The patient has been markedly relieved by the operation.

No reason can be ascribed for the condition of the ovary (the pathologist reported "hemorrhagic cyst of ovary"). There was no sign of any tubal or other infection. It is hardly conceivable that the simple displacement could have accounted for it. Here was hemorrhage not only into the ovary itself, but from it as well. The process had produced adhesions.

Wolf[53] has reported eight such cases of hematoma of the ovary. In four of his cases the condition was complicated with myoma of the uterus, one with tuberculous peritonitis, and in two with pelvic peritonitis.

Meriel[32] reports a case of dysmenorrhea in a patient fourteen years of age in whom this condition was found. No reason for the occurrence could be discovered. There are many other cases of this group reported in the literature. There is chronic retention of blood in the follicles. The disturbance is first seen in the vascular tunica interna of the distended follicles, hemorrhage into the follicle follows. The hematoma presses upon the surrounding ovarian tissue and hemorrhage takes place into the stroma. The affected organ is surrounded by adhesions.

The condition is usually associated with some other, as Wolf has stated, to which it can be secondary. We have all seen it associated with pelvic tumors. These hematomas rarely give rise to severe hemorrhage. In many of the cases no cause for the condition can be traced, as in the case of Meriel and my own.

The third group is one in which cysts of various size give rise to hemorrhage either into the tumor itself or externally into the abdominal cavity. The cause may be a torsion of the pedicle, or traumatism, or perhaps it is not discovered. When cysts of any size are fixed in the pelvis by adhesions, one very likely cause of hemorrhage has seemed to me to be trauma. Strains or falls might conceivably produce it. I personally know of one case where such a cyst was ruptured from coitus, though in this particular instance without hemorrhage. Bleeding into an ovarian cyst may give rise to symptoms simulating ectopic pregnancy—a case of my own is in point.

K. P., aged twenty-seven. No children, but was operated five years previously for right tubal pregnancy. At this operation, which was performed some time after the rupture had taken place, there were many adhesions, and in freeing the left tube for inspection the fimbriated extremity was torn away. The rest of the tube was left *in situ*, with the hope that it might allow pregnancy. The right was removed, leaving two good ovaries.

In November, 1919, she was suddenly seized with pain in the lower abdomen, resembling somewhat her former attack. Pain decreased slowly—no signs of shock. At the end of about six days an examination revealed a fixed mass in the culdesac extending to the left pelvic wall. A repetition of her former trouble was considered.

At operation the appendage was found surrounded by firm adhesions, the ovary containing a cyst somewhat larger than a tennis ball. It was filled with blood clot. The tube was closed and adherent to the surface. The appendage was removed, leaving a healthy right ovary. Recovery.

Michon[33] reports a case of torsion of the pedicle of a solid ovarian tumor, with hemorrhage into the abdominal cavity. (Hemorrhage into a cyst under the same conditions is not uncommon.) Le Moinet[27] reports a case of rupture of the pedicle of a dermoid cyst. Jayle[28] gives an extensive bibliography of hemorrhage from the ovary, and I would refer those interested to it. Many of the best articles appear in the bibliography appended to my paper.

Hemorrhage from a nonpregnant tube is rare. I can find no instance in the literature of the last twenty years in which a violent hemorrhage has occurred that could not be questioned. Some bleeding into the tube with clots, however, may occur, but I believe is uncommon. Bazy[4] goes into the pathology of three such instances, and I have in mind one instance in which I found a small amount of blood in a tube, the result of an old Neisser infection. Some bleeding into a tube the subject of torsion I have seen in a few instances.

An interesting group with hemorrhage into the abdominal cavity is formed by fibroids. This is aside from the hemorrhage from an ovary that is associated with such a tumor. Wallace[54] cites seventeen cases (and five doubtful ones) in which this occurred. The bleeding has often been a serious one and the mortality has been very high (25 per cent). The hemorrhage has usually come from a vein or sinus on the surface of the fibroid by the establishment of an opening in some weak spot in the vessel wall. The yielding of the weak spot has been caused by some sudden effort on exertion, or as a result of increased tension in the myoma itself, consequent to torsion of the pedicle of a pedunculated tumor. In four cases the vessels were injured as a consequence of laceration of a solid myoma or in the rupture of a cystic one; in one instance by an eroding ulceration caused by pressure of a bony projection against the tumor.

Gerstenberger[20] reports the case of a nurse who had been in the habit of lifting a heavy patient. She was seized with sudden faintness and at operation there was found a rent in the uterus from which severe hemorrhage had occurred. The myoma was removed and the patient recovered.

Wallace discusses the question of treatment of these cases. He suggests that in view of the very high mortality control of the hemorrhage alone should be undertaken, the removal of the tumor to be left to a more favorable time.

It is surprising that accidents of this kind are not more frequent. I have had no personal experience with them, but I very recently had reported to me by Dr. Wynand Pyle of Grand Rapids a case coming under his observation, in which this accident probably occurred. The patient was a maiden lady, over

fifty years of age. She fell accidentally on the street, was helped to her home. She became faint and short of breath. He saw her soon after and an examination revealed a hard tumor, evidently a fibroid, in the lower abdomen. She gave distinct evidence of a hemorrhage and died at the end of three hours, unoperated. No autopsy was allowed.

REFERENCES*

1Adams, F.: Hemorrhage from a Corpus Luteum Cyst, Brit. Med. Jour., London, 1913, 1, 712.

2Arrivita, M.: Les hémorragies génitales d'origine ovarienne; discussions pathogéniques et thérapeutiques. Gaz. d. hôp., Paris, 1914, lxxxvii, 1371-1411.

3Bartelo, C. D.: Can Rupture of the Corpus Luteum Cause Severe Intraperitoneal Hemorrhage? Ugeskr. f. Laeger., Kobenh., 1919, lxxxi, 935-946.

4Bazy, L.: Des hémorragies de la trompe non gravide. (la pachysalpingite hémorragique). Rev. de Gynec. et de Chir. Abd., Paris, 1910, xv, I, 91, 2 pl.

5Bender and Marcel: Intraperitoneale Blutung infolge Ruptur einer haemorrhagischen Ovarialcyste, Bull. et mém. de la Soc. Anat. de Paris, July, 1904.

6Benthin: Hematocele als Folge einer geplatzen Corpus luteum Cyste, Monatschr. f. Geburt. und Gynak., Berlin, 1913, xxvii, 532.

7Bertkrau: Schwere Blutung in die freie Bauchhöhle aus einem Ovarium. Charité-Ann., Berlin, 1910, xxxiv, 571.

8Boveé, J. Wesley: Tubal and Ovarian Hemorrhage, Surg., Gynec. and Obst., Chicago, 1919, 1, xxviii, 117.

9Boudey, F. J.: Contribution a l'etude des kystes Hematiques de l'ovaire. Thèse, Bordeaux, 1903.

10Bookman, M. R.: Rupture of a Corpus Luteum with Free Intraperitoneal Hemorrhage, Med. Rec., New York, 1914, lxxxvi, 184.

11Bonneau, R.: Hemorrhagie intraperitoneal recidivante par ruptur d'un follicle de Graaf., Paris Chirurg., 1912, iv, 1101-05.

12Cantoni, V.: Untersuchungen über Ovarialblutungen, Arch. f. Gynäk., Berlin, 1914, ciii, 564-574.

13Cranwell, D. J.: Inondation peritoneale par rupture d'un follicle de Graaf, Ann. de gynec. et d'obstet., Paris, 1912, 2 s., ix, 226.

14Dubreuil, G., and Regaud, C.: Sur les follicules ovariens hèmorragiques et sur mécanisme de déhiscence des follicles. Compt. rend. Sceances et Memoires de la Soc. de biol., Paris, 1909, lxxvii, 828-830.

15Edgard, J.: Ruptured Hematoma of the Left Ovary, the Cause of Pelvic Hematocele, Glasgow Med. Jour., 1900, liii, 294.

16Engstrom, Z.: Die Entstehung von grossen intraperitonealen Blutergüssen bezw. von Hematocele durch Blutung aus einem Corpus Luteum. Mitt. a. d. Gynäk. Klin. d. O. Engstrom in Helingsfors, Berlin, 1907-08, vii, 147-155.

17Ferguson, James Haig: Case of Fibroid of the Uterus (Showing Unusual Form of Cystic Change) Removed by Supravaginal Hysterectomy, Where Severe Post-operative Hemorrhage Occurred from a Corpus Luteum, Necessitating Reopening of the Abdomen and Removal of the Ovary, Eding. Obst. Trans., 1911-12, xxxvii, 307.

18Forssner, H.: Können grosse intraperitoneale Blutungen aus Graafschen Follikeln oder Corpus Luteum Bildungen ohne Vorhandensein von Schwangerschaft entstehen: Arch. f. Gynäk., Berlin, 1916, cv, 74-106.

19Gabriel, A.: Ueber die Entstehung der hematocele retrouterina aus Ovarialblutungen, Arch. f. Gynäk., 1901, lxiv, 449.

20Gerstenberger, E.: Schwere intraperitoneale Blutung aus seitlichen Venen des Uterus bei subserösem Myoma des Fundus, Zentralbl. f. Gynäk., 1916, No. 40.

21Hind, W.: Sudden Hemorrhage from the Ovary, Brit. Med. Jour., 1905, ii, 189.

22Jayle: Pelvic Hematocele from Rupture of Blood Cyst of Ovary, Revue de Gynec. et de Chir. Abdomen, 1909, xiii, 185-222; Abstracted in Brit. Med. Jour., 1909, xvi, 50.

23Kober: Hematocele Retrouterina ohne Extrauterine Gravidität. Zentralbl. f. Gynäk., 1901, Nr. 39, p. 107.

24Kynoch, J. A. C.: Pelvic Hematocele from Rupture of a Blood Cyst of the Ovary, Jour. Obst. and Gynec. of the Brit. Emp., London, 1913, xxiii, 304.

25Ladinski, I. J.: Bleeding from a Corpus Luteum, Am. Jour. Obst., 1910, lxii, 487.

26Lee, J. A.: Hemorrhagic Cyst of the Ovary Simulating Ectopic Pregnancy, Brooklyn Med. Jour., 1905, xix, 209.

*This bibliography includes only the literature appearing since 1900. Before that time the accounts for the most part do not clearly establish the fact that the hemorrhage was not due to ectopic pregnancy, and it was thought best to omit them altogether.

[27]Le Moinet: Rupture spontanee du pedicle d'un kyste dermoide de l'ovaire. (Rapport de F. Leguen). Bull. et mém. Soc. de Chir. de Paris, 1912, n.s., xxxviii, 315-317.
[28]Leriche, R., and Blanc-Perducet, M.: Hémorragie pelvienne intra-peritoneale diffuse par ruptur d'un kyste hemorragique. Revue de Gynec. et de Obst., Par., 1911, 2 s., viii, 529-534.
[29]Lockyear, Cuthbert: Pelvic Hematocele of Ovarian Origin, Proc. Roy. Soc., London, 1910, viii, Part 2, p. 106. (Obst. and Gyn. Sec.); also Jour. Obst. and Gynec. Brit. Emp., 1910, xvii, 253.
[30]Luker, S.: A Case of Rupture of a Hemorrhagic Corpus Luteum into an Intraligamentary Cyst, Resembling Ruptured Ectopic Pregnancy, Lancet, London, 1912, ii, 1075.
[31]Martin, P. F.: Tubo-ovarian Hematocele Simulating Ectopic Gestation; Surgical Conservatism in Dispute, Jour. Indiana Med. Assn., 1910, pp. 481-484.
[32]Meriel: Ovarian Hematoma Causing Dysmenorrhea, Soc. Obstet., Toulouse, 1911, xiii, No. 2, p. 84. Abstracted in the Jour. Obst. and Gynec. of Brit. Emp., 1911, ii, xx, 139.
[33]Michon, E.: Tumeur solide de l'ovaire; torsion du pedicle; hemorragie intraperitoneale; laparotomie; guerison apres embolus pulmonaires. (Rapport de Souligoux). Bull. et mém. Soc. de Chir. de Par., 1909, n.s., xxxv, 1072-1077.
[34]Novak, E.: Abdominal Hemorrhage of Ovarian Origin with Report of a Case Due to Rupture of a Small Follicular Cyst, Jour. Am. Med. Assn., 1917, lxviii, 1160-1162.
[35]Novak, E.: Hematoma of the Ovary, Including Corpus Luteum Cysts, Bull. Johns Hopkins Hosp., 1918, xxxviii, 736-738.
[36]Ohman, K. H.: Ovarian Hematoma and Ovarian Hemorrhage, Duodecim Helsinki, 1913, xxix, 55-76.
[37]Pfeilstieker, W.: Ueber lebensbedrohliche intraperitoneale Blutung aus einem Graafschen Follikel. Med. Cor. Bl. d. Würtemb. ärtzl. Landesver., Stuttg., 1913, lxxxiii, 535-536.
[38]Poulain, J.: Hematocele retro-uterine sans rupture de la trompe. Rev. mens. de gynec., d'obstet. et de pediat., Paris, 1910, v. 76-78.
[39]Primrose, A.: Hemorrhage into the Peritoneal Cavity, Caused by Accidental Rupture of the Ovary, Trans. Am. Surg. Assn., 1912, xxx, 599-607.
[40]Roll, J.: Life Endangering Bleeding from the Ovary, Norsk. Mag. f. Laegevidensk., Kristiana, 1911, S.R., ix, 27-31.
[41]Romme, Madeline: Hemorrhagie abdominale d'origine ovarienne. Ann. de gynec. et d'obstet., Paris, 1917, 2 s., xii, 736-738.
[42]Rosseau, E.: Hemorragies ovariennes, Jour. Med. de Bruxelles, 1903, viii, 785.
[43]Seadorff, M.: Hematoma ovarii dets fremkonist og kliniske be lydoning Hosp. Tid., Kbenh, 1913, 5 R. I., vi, 73-93, 1 pl.
[44]Simonds: Peritonealblutung aus einem geplatzen Graafschen Follikel. München. med. Wchnschr., 1917, lxiv, 1565.
[45]Tartansen: Pelvic Hematocele; Uterine Fibroid Disease; Rupture of Haematic Cyst of Ovary; No Ectopic Gestation, Jour. Obst. and Gynec., Brit. Emp., London, 1910, xvii, 246.
[46]Taylor, G.: Some Uncommon Causes of Pelvic Hemorrhage in Women, Practitioner, London, 1918, ci, 37-39.
[47]Trassman: Ueber Eierstockblutungen, Berl. klin. Wchnschr., 1917, liv, 567.
[48]Walters, C. H.: Hemorrhage into an Ovarian Cyst, Simulating Ectopic Pregnancy, Jour. Am. Med. Assn., 1918, lxx, 295.
[49]Warnshuis, F. C.: A Report of a Case of Ruptured Ovary, with Large Intra-abdominal Hemorrhage and Symptoms of Recurrent Appendicitis, Phys. and Surg., Ann Arbor and Detroit, 1912, xxiv, 123.
[50]Whitehouse, B.: Hemorrhage into the Ovary, Associated with Severe Dysmenorrhea, Jour. Obst. and Gynec. Brit. Emp., London, 1914, xxvi, 152-154.
[51]Wilson, H. W.: A Case of Hematoma of the Ovary, Simulating an Attack of Appendicitis, Lancet, London, 1905, i, 1196.
[52]Winiwarter: Retrouterine Hematocele Due to Bleeding from a Degenerated Ovary, ztschr. f. Geburt. und Gynäk., 1911, lxviii.
[53]Wolf, E. H.: Ueber Haematoma Ovarii, Arch. f. Gynäk., 1908, lxxxiv, 211-243.
[54]Wallace, A. J.: Intraperitoneal Hemorrhage in Cases of Fibromyomata of the Uterus, Jour. Obst. and Gynec. Brit. Emp., London, 1910, xviii, 357.

METZ BUILDING.

(*For discussion, see p.* 302.)

STERILITY IN THE FEMALE*

A Report of Operative Cures

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IT IS not possible for me to present in this paper anything like a complete list of cases operated upon for sterility, neither is it my desire to enter into an extensive consideration of the possibility of relieving female sterility by surgical means. It is only by a report of cases cured at operation that I hope to combat the growing pessimism of the profession on this subject, as reflected in the recent obstetric and gynecologic literature. Though small in number, these cases have been carefully studied and followed up, and serve fairly well as illustrative examples of what it is possible to accomplish in the surgical relief of sterility.

I am well aware of the fact that many successful operations for sterility have been performed in the past, and many will, in all probability, be performed in the future. This must of necessity be so in this as in other branches of surgery, but as the subject is more carefully studied results will improve. Only too often is the fertility of the male taken for granted and, as a result, many women are operated upon unnecessarily and unjustifiably. I am glad to say, however, that I believe few gynecologists of today would think of subjecting a woman to any surgical procedure aimed at the cure of a condition for which she was not to blame, but there is still, I am sorry to say, a tendency on the part of many general practitioners to recommend a little "stretching and scraping" to every disappointed bride who consults them. Many of these take such a deep interest in the case as to actually perform the operation themselves. Much of the surgery of the past aimed at the cure of sterility, has been of this "family doctor" type and with the expenditure of very little real thought or study. The reproductive function is of paramount importance to the race and the question of sterilization is deserving of most faithful study. Every case of absolute sterility cured by operative measures, and they can be cured in no other way, is a triumph for surgery and should be duly recorded. When the end result is the birth of a living child, and the fruit of the surgeon's work carried on, perhaps, to generations yet unborn, then indeed is the victory great. Surely it would be difficult for any other department of surgery to confer a greater reward on the operator, or to show results of greater value to society.

With a constantly increasing rate of sterility among our native born, every childless marriage is deserving of most careful study. I wish that it were possible for me to place before you in this paper a complete record with end results of every case I have operated upon for sterility, or in which I have, when operating for other conditions, endeavored to relieve coexistent

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sterility. This is impossible, however, for it is only within comparatively recent times that our hospitals in New York have instituted anything like adequate follow-up systems, and many of my early ward cases have been lost sight of. With a constantly shifting population it is difficult to even keep track of private cases, and I am forced, therefore, to limit myself to a few cases of which my records are complete. I do this with a realizing sense, however, that somewhere, in some bureau of vital statistics, there are successful cases recorded that I am unable to put down here.

In order to treat intelligently any given case of sterility it is necessary to decide within as narrow limits as possible the cause, or causes of the sterility. Many times this offers such difficulty that only an approximation can be reached, and that only by a process of elimination. But the more carefully these cases are studied the less frequent becomes the necessity of depending upon a diagnosis by elimination. Possibilities yield to probabilities and as our skill in observation and deduction increases, the etiologic factor will often be found with quickness and certainty.

CASE 1.—Mrs. D. R., operated upon April 10, 1903. This patient was thirty-two years of age with a sterile married life of eight years. She acquired at the outset of her married life an attack of acute pelvic peritonitis, and suffered during several years from frequent subacute exacerbations. The examination showed a rather small uterus, anterior in position, with marked restriction in mobility. The right adnexa were enlarged and adherent, and the left enlarged, adherent, and prolapsed. Both sides were tender on examination. Ever since her first attack she had suffered from menorrhagia, dysmenorrhea, backaches, pelvic pain and increasing nervousness. At operation the pelvic condition was approached through an anterior vaginal incision, but on opening the peritoneal cavity the condition was found to be too extensive to handle by this route. The abdomen was therefore opened revealing the following conditions: Both ovaries were small and buried with the tubes in extensive velamentous adhesions to the broad ligaments, rectum, and posterior face of the uterus. These were freed and the ovaries and tubes released. The tubal ends were closed, showing a typical clubbed formation. The lumen of the left tube was so completely occluded, and the ovary so destroyed in freeing it from adhesions, that these were removed. The right tube was opened and probed, and a plastic reconstruction of the fimbriated end carried out. The subsequent convalescence was uneventful. A marked improvement in all symptoms resulted, and the menstruation became regular and painless. Eighteen months after operation she gave birth by a normal delivery at term, to an eight pound baby, and eighteen months later a daughter was born at term. Both children living.

In this case the picture presented at operation was typical of the ravages of gonorrhea when once the infection gains access to the pelvic organs. The woman was absolutely sterile. Complete embedding of the ovaries prevented the liberation of ova which, even had escape been possible, could not have been taken up by the tubes in their occluded condition. Yet observe the lightning rapidity of result when the path to the uterus had been cleared of obstruction. Eight years sterility, operation, successful delivery within eighteen months.

CASE 2.—Mrs. C. P., operated upon May 14, 1910. This patient was twenty-two years old, had been married three years, and had always suffered from

severe dysmenorrhea, backaches, and continuous pelvic pain and sterility. Examination showed a uterus of extreme anteflexion with no demonstrable involvement of the adnexa. At operation, through a transverse abdominal incision, the tubes were found to be normal but both ovaries were cystic, enlarged, and with greatly thickened cortex. A careful inspection of both ovaries failed to reveal any scars that would denote previous rupture of a Graafian follicle; it was, therefore, concluded that this was a case of sterility caused by the inability of the Graafian follicles to rupture through the thickened cortex of the ovary and discharge their ova. Both ovaries were resected, and cortical stripping done on the right one. The convalescence was uneventful, and during the following year she gave birth at term to her first child. Three years later a second child was born at term, and when last heard from on July 13, 1914, both children were living and she was pregnant for the third time.

Here, a long period of chronic oöphoritis had so thickened the ovarian cortex as to prevent the free rupture of the Graafian follicles and liberation of the ova. This was clearly indicated by the entire absence of rupture scars on the surface of either ovary.

Case 3.—Mrs. A. C., operated upon September 17, 1910. This patient was nineteen years of age, had been married three years and a half. In 1908 she had a miscarriage at six months, followed by a prolonged convalescence with elevation of temperature and pulse. Recovering from this she was left with continuous pelvic and abdominal pain. On examination the uterus was anteflexed and showed marked restriction in mobility. No disease of the right adnexa could be demonstrated, but the left were enlarged, prolapsed, adherent and tender. At operation, through a transverse abdominal incision, the appendages of both sides were found prolapsed and adherent, the tubes being closed at their distal end by adhesions. The ovaries were likewise slightly adherent, though otherwise normal in appearance. Both tubes were opened, and the adherent ovaries freed. Convalescence was uneventful. On August 28, 1911, she was delivered at seven and one-half months of a living child.

The infection responsible for the tubal occlusion in this patient was not gonorrheal as in Case 1, the tubes themselves appearing normal with the single exception of their fimbriated ends. These were closed by adhesions to the pelvic peritoneum, to which, in all probability, they had become agglutinated during the attack of pelvic peritonitis accompanying puerperal infection. After the fimbriæ were released the tubes appeared quite normal, and resection or reconstruction was necessary.

Case 4.—Mrs. E. T., operated upon October 15, 1910. This patient was twenty-four years of age and had been married nine years. In June, 1903, she was delivered at term of her only child. There had never been any other pregnancy. She complained of sterility, backaches, and occasional pelvic pain. The examination showed a uterus normal in size and position but restricted in mobility. The appendages of both sides were enlarged, prolapsed, adherent and tender. At operation, through a transverse abdominal incision, the adnexa of both sides were found prolapsed and adherent. The ovaries appeared normal, both tubes were closed. The occluded ends were opened and the tubes probed to the uterine cavity. The convalescence was uneventful and she was delivered at term, ten months after operation, of a living child.

The nature of the infection in this case could not be determined. She gave no history of a previous gonorrhea, and could not recall any details that would indicate an infection in her puerperium. In all probability the infection in this case was of similar character to Case 3.

CASE 5.—Mrs. L. K., operated August 10, 1916. In this case the patient was thirty-three years of age and had been married two and one-half years. She had never been pregnant but complained of continuous pain in the left lower abdominal quadrant, following a sudden attack, with nausea and vomiting one year previous. The examination showed an anteflexed uterus, tender on palpation and slightly restricted in mobility. No enlargement of the adnexa could be made out, but there was marked tenderness on both sides. At operation, through an abdominal incision, it was found that both adnexa were adherent to the broad ligament and omentum. The tubes were closed, presenting a typical clubbed appearance. The left was a large hydrosalpinx, densely adherent to a cystic ovary. These adnexa were removed. The right ovary appeared normal when separated from the adhesions to the broad ligament and tube. The tube was opened and probed to the uterine cavity. Convalescence was uneventful; she became pregnant three months after operation, and was delivered at term of a living child.

Gonorrhea was undoubtedly the infective agent in this case, as indicated by the typical clubbed tubes and the large hydrosalpinx on the left side.

CASE 6.—Mrs. L. V., operated upon October 27, 1916, at City Hospital. Patient twenty-seven years of age. Married eight years, had given birth by normal labors to four children, the last in 1912. One miscarriage at five months in 1909. Chief complaints, menorrhagia, dysmenorrhea, and pelvic pain. On examination the uterus was found normal in size and position, but with marked restriction in mobility. Both adnexa were slightly enlarged and tender. At operation, through a transverse abdominal incision, the appendages of both sides were found adherent to the broad ligaments and uterus. The ovaries, when separated from adhesions, appeared normal, but both tubes were occluded at their distal ends. These were opened, and the right probed free to the uterine cavity. The left showed an obliteration of its lumen in the middle third, through which it was impossible to pass the probe. The tube was opened at this point, and the obliterated portion, about half an inch in length, removed. An anastomosis of the tube had become secure. Convalescence was uneventful. Three years later on September 23, 1919, she was delivered spontaneously of a living child.

Here we had to deal with the results of a postabortive infection, presumably lymphatic, as in Cases 3 and 4, although the obliteration of the lumen of the left tube in its middle third might indicate a previous active inflammatory process at this point. Whether conception resulted by means of this anastamosed tube could not, of course, be determined. I have never been able to trace a cure of sterility to this operation, although there have been several reported in the literature.

CASE 7.—Mrs. J. F. G., operated upon in the Polyclinic Hospital September 17, 1919. This patient was twenty-five years of age, had been married for two years and had never been pregnant. She complained of occasional pelvic pain, backaches, and periods of mental depression because of her sterility. Examination showed a small retroverted uterus with no demonstrable lesion of the appendages. At operation the anterior vaginal wall was lengthened and the abdomen opened. Both ovaries showed marked cystic enlargement with thickening of the cortex. These, on close inspection, showed no

evidence of a previously Graafian follicle rupture. The entire surface of both ovaries being smooth, glass-like in appearance, and entirely innocent of any scar that would denote follicle rupture. Both ovaries were resected with cortical stripping of the right, the uterus replaced, and the round ligaments shortened. Convalescence was uneventful. She became pregnant three months later and was delivered at term, on September 14, of a living child.

Similar to Case 2, only with retroflexion instead of anteflexion.

CASE 8.—Mrs. P. R., operated upon May 31, 1918, at the Polyclinic Hospital; thirty-two years of age. This patient had been married four years without ever having been pregnant. She complained of backaches, dysmenorrhea, pelvic pain, and sterility. On examination the uterus was found enlarged, clubbed, prolapsed with the ovaries, and adherent, and contained a fibroid at the fundus two inches in diameter, with two smaller subperitoneal fibroids. The left tube was removed, the right tube opened and probed to the uterine cavity. The uterus freed from adhesions, replaced, and the round ligaments shortened. Convalescence was uneventful, and on March 18, 1920, the patient was delivered of a living child at term.

In this case the pelvic organs presented a picture typical of a previous attack of gonorrhea. As both tubes were occluded the retroflexion and fibroids could not be considered as a cause of the sterility.

CASE 9.—Mrs. C. B., operated upon November 21, 1918, at the New York Nursery and Child's Hospital. This patient was twenty-eight years of age and had been married three years. Six months after marriage she had a two months' pregnancy interrupted, and had suffered from menorrhagia, dysmenorrhea and pelvic pain since that time. Her last menstruation had occurred ten weeks before, and there had been almost daily spotting since that time. Examination showed the uterus anterior in position, slightly enlarged, tender on palpation, and with marked restriction in mobility. Both tubes were tender and the right markedly enlarged. She had been curetted on a diagnosis of incomplete abortion six weeks before. A diagnosis of unruptured right tubal pregnancy was made. At operation, through a transverse abdominal incision, a large unruptured right tubal pregnancy was removed, together with a congested, adherent appendix. Inspection of the left adnexa showed a prolapsed, adherent, closed tube. Both ovaries were normal. The tube was freed, opened, and probed to the uterine cavity. Convalescence uneventful. She subsequently became pregnant and was delivered on October 23, 1919, at term by normal labor, of a living child.

The nature of the infection in this case was uncertain. As only one tube was occluded, it is more than probable, however, that it resulted from the induced abortion shortly after marriage. Although the patient was pregnant at the time of operation I have included her in this series because, with the removal of the right tube in the presence of the occluded left, she became a case of absolute sterility, and would have so remained had the occlusion not been relieved. Here is a good illustration of the importance of always examining the opposite adnexa when operating on tubal pregnancy, not only because of the possibility of the existence of a bilateral tubal pregnancy, but because the remaining tube may be occluded and the woman left hopelessly sterile unless it is relieved.

CASE 10.—Mrs. D. M. O., operated upon in the Woman's Hospital, March 3, 1908. This patient was forty years old and had been married three years without ever having been pregnant. Her menstruation had begun at fourteen

years of age and had always been regular, lasting seven days. Ever since her marriage and for a number of years before, she had complained of constant pelvic pain, backaches, and dysmenorrhea for which she had been treated locally at different times. An examination showed a small retroverted, adherent uterus, with enlarged, prolapsed, adherent and tender appendages on the left side. At operation, through a transverse abdominal incision, both ovaries were found low down, and adherent. The uterus lay in extreme retroversion and was also adherent. The tube were short, and situated high up on the broad ligament. Both ovaries were freed from adhesions and the left, showing marked cystic enlargement, was resected. The uterus was likewise freed from adhesions and the round and the uterosacral ligaments shortened. Convalescence was uneventful. Conception promptly took place and the patient was delivered at term of a living child on May 2, 1909.

In this case there are several points of more than passing interest. The condition of adherent retroflexion is commonly associated with a low degree of fertility, and when the ovaries are covered with adhesions in addition, absolute sterility is the rule. At her advanced age of forty years there seemed very slight hope of relieving the sterility. Yet witness the brilliant result obtained less than fourteen months later; a most encouraging example of the promptness with which nature will act when given the proper assistance.

CASE 11.—Mrs. J. H. F., operated upon in the Woman's Hospital on October 26, 1914. She was thirty-six years of age, had been married one year, without ever having conceived. Menstruation began at fourteen years of age, was always regular, lasting eight days, and was very profuse. Slight dysmenorrhea had developed during the year of married life, otherwise she was free of symptoms other than the sterility. Examination showed a somewhat enlarged retroflexed uterus. The enlargement was irregular in character, indicative of the presence of small fibroids. At operation, through a transverse abdominal incision, four of these, the largest two inches in diameter, were removed from various parts of the anterior and posterior uterine walls. A larger intrauterine fibroid was removed from the uterine cavity through an incision made in the anterior uterine wall. Adhesions between the uterus adnexa and rectum were separated, the uterus replaced and the round ligaments shortened. Conception promptly occurred and she was confined at term on September 14, 1915, by a breech delivery of a living child. The labor, though her pains were strong, was a protracted one, lasting twenty-one hours. The child weighed 6 pounds, 1½ ounces. Her second confinement occurred in November, 1917. Normal eleven-hour labor, 8 pound baby. Third confinement May 15, 1919. Normal five-hour labor, living child weighing 8 pounds, 14 ounces.

Multiple fibroids of the uterus are attended with a low degree of fertility, but it is not unusual for their removal, even as late as the age of thirty-six, to result in a cure of the sterility. This patient's subsequent obstetric history is a particularly gratifying triumph for enucleation. Only too often in these cases is the woman deprived of all hope of maternity by a hysterectomy, or radium or x-ray treatment. Had this patient been so treated the world would have been a very dark place indeed for her, and three healthy children would never have seen the light of day. Her first confinement, a protracted breech delivery, with strong labor pains for twenty-one hours within less than one year after operation, shows how firmly the incision in the uterine wall, through

which the fibroid in the uterine cavity was removed, had healed. The maintenance of the normal position of the uterus after three puerperiums is a particularly gratifying tribute to the operation of ligament shortening by which the retrodisplacement was corrected.

SUMMARY

In this series of cases the average period of sterility was three and one-half years. One case of seven years' duration was cured in ten months. The average time from operation to the birth of the first child was 15.3 months, while seven patients gave birth within one year after operation.

Seven of these patients were unconditionally sterile due to tubal occlusion, and these subsequently bore eight children—quite a respectable sized family—that owe their appearance in the world absolutely to conservative surgery. These eleven women operated upon have, to date, borne 16 living children, and eight are still in the childbearing period.

Such results as have been obtained in these cases should go far towards creating in the surgeon added respect for the art he practices and a firmer belief in the value of conservative gynecology.

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(*For discussion, see p.* 306.)

ARTIFICIAL IMPREGNATION: ESSAYS IN TUBAL INSEMINATION*

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THE only unimpugnable evidence of efficacious instrumental insemination comes from our successful and scientific brother the veterinarian, because he can exercise complete supervision over his patient. Human tests are blocked by aversions, vitiated by reticences, and happy results are not susceptible of rigid proof, because intercourse may have followed treatment. The plausibility of any claim must rest on the publication of histories and methods in some detail. All attempts should be listed, inasmuch as this is one of the clinical series in which no one observer is able to present any large group of cases. The records will follow in a later article. In this paper the technic is reported on, with a summary of results.

As marriage is an experiment in procreation without preliminary tests for fitness or instruction in method, it should be considered satisfactory that there occur something like 90 per cent of successes—although some cities and countries average 20 per cent of childless marriages. Inability to conceive at all accounts for about half the "sterile" marriages (Schaeffer). The husband's defective semen, judged mostly from a single examination of a condom specimen, is generally said to be responsible for one in five of these disabilities, but Huhner doubles this particular figure, and I also would place it higher. We have then to consider those couples where the semen is vigorous and there is no obstruction in the lower genital passages, and no infection. Even where an anteflexion or retroversion is present, before operation is considered the woman is entitled to any measure that holds out a reasonable promise. Suppose this method of artificial insemination does hold out a reasonable promise. Then the program will be as follows. Man and wife are each brought up to good physical condition and their sex-life is studied and regulated. These measures failing, trial will be made of a course of instrumental impregnation. The presence of marked flexion or mobile retroversion need not preclude this, since safe passage through the dangers of the miscarriage period can usually be accomplished with a sufficient degree of care. The instrumental instillation failing, operation may be done for well marked anteflexion or retroversio-flexion, particularly in the presence of real pain or disability. Laparotomy on the single indication of sealed tubes to be opened or deployed is generally frowned upon because of a common agreement in the reports of scant success. Laparotomy to study and incise the ovaries, where it is supposed ova need freeing, has an advocate in Reynolds. Laparotomy after six months of marriage just to find out what can be the matter with a woman who appears to be sound has been urged only by Solomons of Dublin. Whatever the program that appeals to any student of the question, there will hardly be denial that better knowledge is needed concerning what constitutes normal sex life, concerning the male secretion, genital incompatabilities, and physiologic deficiencies.

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Nor can some or all of the following considerations be passed by in any particular problem under review.

PRELIMINARIES

Verification of the male secretion will one day be the routine first step. Two or three microscopic examinations are needed. Semen does not run true to form. It is a gauge very sensitive to changes in general physical condition and may present quick and sweeping alterations without apparent adequate reason. Activity of spermatozoa is of major importance, but survival-hours are all-important too. Stated in the baldest terms, the two requisites are that in the fresh warm specimen seen in the deep covered slide speedy transits across several fields should be under way, and, furthermore, at room temperature, activity should persist for hours. One may see the trapped tail, the feeble stroke, short lived action, or even azoospermia yield to a vacation or reduction of obesity, and such betterment, combined with cure of the commonest sterility lesion in women, endotrachelitis, sufficient to start a family. Coitus is to be regulated. Prolonged intervals may produce as poor specimens as undue frequency. An individual has a normal cycle which will deliver the best result, and this might be worked out, but 7 to 10 days is a fair average for the liveliest persistence in my few studies of multiple specimens.

On the part of the woman, correction of flabby or rapid obesity counts, as does general condition, good periods, and sex responsiveness.

Leucorrhea of an acid or purulent character is to be arrested, and this goes hand in hand with its main cause, unhealthy condition of the lining of the cervix. The spectacular cures are those in which healing of the raw surface or drainage of the clogged canal is instantly followed by conception.

The mild alkaline douche an hour or so before coitus is in use for strongly acid vaginal secretions and will be used even where litmus does not make any such accusation. I cannot get a chemist to devise any simple quantitative test of vaginal acidity.

Study of the reaction of a vaginal secretion on a particular semen is of limited application for most doctors in office work, and tests carried up into the cavity of the uterus are subject to too many errors to belong to any but a few experimenters. Some of these moot points are touched on in the second portion of this paper.

Retention of semen by a condom-covered tampon, inserted at once after emission, may be tried where the vulva gapes, but my various experimental modifications of pessaries to develop a semen trap have not been effective.

Tests of the patency of the tubes will be routine when the procedure is standardized. I tried Cary's injection of silver salts, with vague x-ray shadows. Cary's simple instillation of sterile fluid in the genupectoral posture is promising. If it disappears in quantities over 10 minims the way should be clear. My trials that show free passage of semen have demonstrated patency in the same way. These procedures are infinitely easier though less certain than the injection of oxygen and its appearance under the diaphragm—calling as oxygen does for apparatus and special skill and with sequelæ sometimes distressing.

Lastly we rule out of consideration patients with gonorrhea or suspicion thereof, tubal distention or tenderness and inflammatory processes of any degree in the pelvis.

TECHNIC

During the office examination one selects the shortest or smallest bivalve speculum that will make a good exhibit of this particular cervix in the knee-chest position, and also tests a snug fitting curved pipette in the internal os. A note or mark is made on the pipette to show how far up 10 minims will fill its caliber. After a date is made—to follow a week of continence—the husband is given a sterile test tube, dry and corked. He is directed to wash carefully and secure a friction specimen about an hour before the appointed time, taking care that the inside of the cork makes no contacts, and to keep the tube warm but not hot, under a warm water bag or in a Thermos bottle. He is to verify by telephone a successful production.

The following are sterilized: bivalve speculum, single tenaculum, two or three pipettes in test tubes, applicators, cotton-tipped, and towel and tray on which to lay out the above. (Forceps and scissors in case condom specimen is to be used). All pipettes to be dried.

At the home some third person is to be near at hand, though not necessarily in sight. Good illumination is needed—droplight and head mirror or headlight preferred. Bladder and bowel are previously emptied. All the materials are spread conveniently at hand. The patient takes a real knee-chest posture at the edge of and across the bed. The bivalve gives a clear view of the ballooned vagina, and also a free play to the uterus such as cannot obtain with this instrument in the dorsal posture. This free play is important in gaining ready access to the cavity of the uterus. The tenaculum steadies the cervix and serves to draw open the canal, which should rarely need to be wiped and on which no antiseptic should be used. The pipette is now very gently filled above a point known to be 10 minims. (The uterus holds 8 to 10 minims.) The tip touches first the interior of the cervical canal as high as may be and is passed to near the fundus. The fit to the internal os prevents regurgitation, or if it does not, one makes a change. Gentle, steady pressure is made on the bulb until "unwell feelings" are produced and continued till there is consciousness of slight distress in the sides of the abdomen low down, at which time the Fallopian tubes are presumed to have fluid in them.

Then pipette, tenaculum and speculum are withdrawn, the patient slides onto her side with the hips a little elevated, to remain thus at least an hour.

The Skene uterine pipette is a bit thicker than a uterine sound and curved like the sound. Its opening must not be minute, as Huhner's curled up forms of defunct spermatozoa are produced by quick suction through narrow orifices. The advantage over any syringe is that the contents are all in sight, the interior is easily cleaned and various sizes are at hand. The sharply recurved single hook of Emmet does not give the discomfort of the heavy double forms.

The following are variants in the above methods. As a substitute for ejaculation into the test tube one is reluctant to concede the use of the condom, as it presents many more possibilities of contamination. The vulva and the

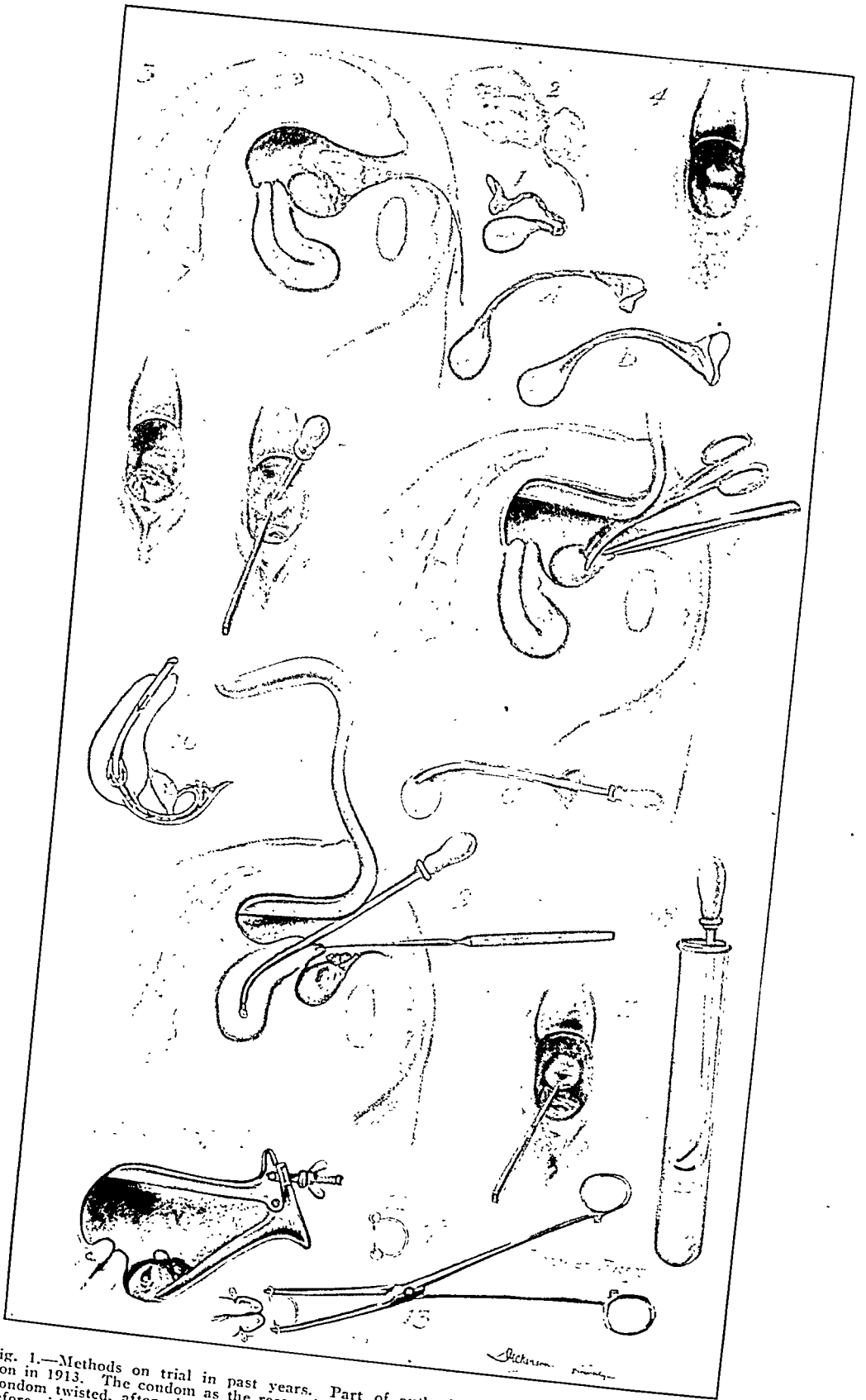

Fig. 1.—Methods on trial in past years. Part of author's exhibit at the International Congress in London in 1913. The condom as the reservoir, pipette instillation, clip closure of cervix. *1.* The neck of the condom twisted, after ejaculation, without removal from the vagina. *2.* The tampon that is introduced before rising to hold the condom in place in order that the patient may come to the office. *3.* The patient in the knee-chest posture. *4.* The speculum in place. *5.* The cover steadied with a forceps and slit, as seen in *6, 7* and *8*. The Skene pipette, sterile dry and warm, sucks from the slit and injects as shown in *9*, into or through the tube, as *10* gives it diagrammatically; *11* is ready for the clip. *12*, placed by a Bozeman forceps as seen in *13*, before and after placing. Alternate plans are given in *A*, and *B* the condom uncoiled with its head still in the vagina, *C*, the pipette passed into it; finally *D*, employing a bivalve in lieu of a Sims speculum when one dispenses with a nurse.

penis are washed, and coitus occurs with the condom. The contents may be kept warm in two ways. One way is to tie the mouth and drop the condom into a test tube which is laid under a warm water bag. The other takes care to leave the cover and its contents within the vagina, twisting the part hanging out and returning this part inside the passage. Under these circumstances there can be no danger of chilling or overheating and thus damaging the specimen. When ready to inject, the patient having taken the knee-chest posture and the speculum being in place, the condom is steadied with forceps and slit with scissors to let the pipette suck out the amount needed. When insemination is done at the office this has been the usual method, the condom having been retained by a tampon furnished to and placed by the patient. Finally it may be noted that one genitourinary specialist obtains a fresh specimen for injection by providing facilities for coitus at the office.

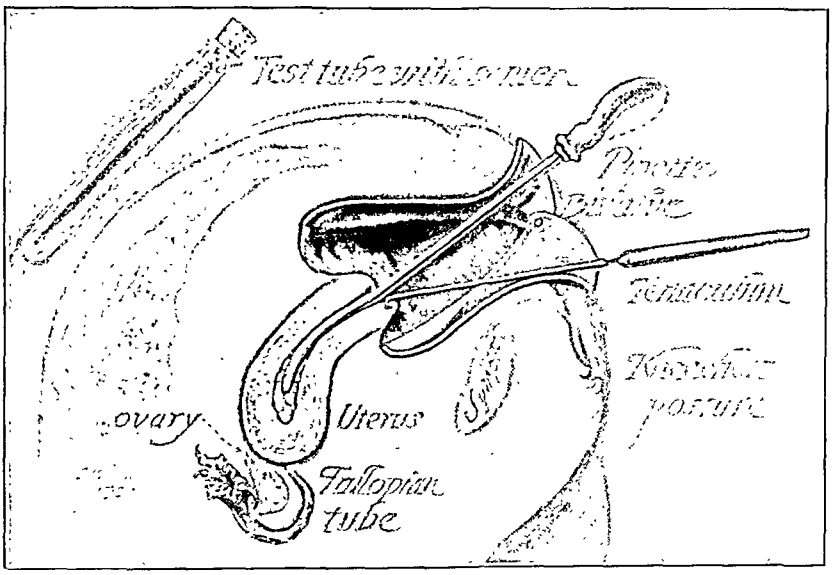

Fig. 2.—Insemination, using a short bivalve speculum, a single, well-angulated tenaculum; a pipette with the curve of a uterine sound and of a size to fit the internal os, and a large rubber bulb. The body of the uterus is shown distended with semen.

Where autoerotic or cover processes completely inhibit, a specimen may be obtained by slipping the mouth of a sterile test tube within the opened labia immediately upon withdrawal. Washing of the genitals of both should have preceded this also. In place of the test tube one of the little spherical soft rubber bulbs with the soft tip has been used. These devices are worth remembering for another purpose, moreover. By such methods of collection semen can be secured in quantity in those instances where a man avers that he is desirous of having children but refuses to take the steps necessary to prove that the default is not his. Some such plan is necessary when he asks for or consents to operation on his wife but declines an essential preliminary, since no surgeon nowadays is excusable for any operative measure or any gynecologist for a course of treatment on a woman for sterility until a good quality of male product can be certified. Finally, this product must be shown

to be of good quality at the time and not merely to have been right in some past period.

OBJECTIONS

1. The possibility of infection of tube and peritoneum cannot be excluded. But normal insemination involves something traveling an inch an hour from the vagina—after labial and subpreputial "smears"—up into the uterus or tube or peritoneum, and all canals exhibit some reverse currents. If we use semen that has spurted clean into a sterile test tube and the cork is safeguarded, a specimen above reproach seems to be furnished. To be sure material from the canal of the cervix may be carried on the tip of the pipette and thrown into the tube and reach the peritoneum. (Curtis has demonstrated bacterial travels.) But in the absence of gonorrhea, of mucopurulent leucorrhea or cervical catarrh, production of salpingitis or peritonitis seems to the writer unlikely with a good technic. So far as symptoms go I am able to report that mong 31 women none developed uterine colic, one with a half-hour tubal colic, and one in bed several days with discomfort, but without exudate or tender tube.

2. Old tubal disease may be lighted up anew. It may, for a tubo-uterine orifice never closes. For the present at least such cases should be avoided.

3. It is possible that all that injection of semen accomplishes is to open the tube, in which case other fluids would do as well, and antiseptics be safer as used by Stone and Boveé. Only tests can tell.

4. One can have no assurance that coitus subsequent to the treatment was not the real agent in procuring conception. This may be true and this is the reason that the veterinary surgeon can offer proofs which we cannot.

5. It fails with semen which is not vigorous. It was devised for just such cases and it has not helped so far.

6. The field is very limited because patients revolt at the idea, or give it one trial instead of half a dozen. They prefer laparotomy. All this is exact, but it does not relieve us of the responsibility of preventing the patient taking the greater risk should there be a simpler way, did we but have the will to face the distastefulness of working it out.

UTERINE INSTILLATION

Uterine instillation is insufficient. The material injected into the cavity of the body of the uterus seemed to drain out promptly. This is probably because of the intermittent contractions normal and constant in nonpregnant uteri, and because a degree of opening up of the internal os has occurred in making the deposit. To overcome this, vaginal tampons were tried and abandoned. A clip was built to snap on the cervix and prevent exit of the semen, but it was not effective. Therefore the deeper placing of the seed was undertaken. All the good results have been obtained since this time.

In so far as repetition of the procedure is concerned, three attempts at monthly intervals should be the minimum and six should be asked, explaining that six months is not an unusual time for normal means in normal people. As to the time of the month, three of our conceptions followed injection within a week of the expected period, the period coming on incompletely.

SUMMARY

In women presenting histories or pelvic findings pointing to the sealed tube following milder types of salpingitis, entirely quiescent, injection into the uterine cavity of active semen produced no results in twelve instances. Strong pressure was not deemed warranted.

In women with no gonorrheal histories or findings, free from cervical inflammations and evident uterine, tubal or ovarian lesions or abnormalities, living semen of the poorer grades produced no results, in nineteen patients. No infection followed except in one possible instance and that of mild type. Several of these received three trials.

With fairly normal pelvic organs and semen of good quality, five pregnancies followed and are believed to have been due to tubal insemination. The knee-chest posture, the curved pipette fitting the internal os and carried nearly to the fundus, injection into the tubes, horizontal rest, and repetition three to six times—these are considered important. Trial of this method may well precede resort to operation—save those done for external obstructions.

438 West One Hundred Sixteenth Street.

(*For discussion, see p.* 306.)

A METHOD OF COVERING RAW SURFACES UPON THE UTERUS*

By George Gellhorn, M.D., F.A.C.S., St. Louis, Mo.

IT IS a surgical axiom that raw surfaces within the abdominal cavity should be covered with intact peritoneum. This, in many instances, is a comparatively easy procedure where only small parts of the intestine have become denuded. When more extensive portions of the intestinal tract are involved as in the removal of large and widely adherent ovarian tumors or fibroids, the prevailing custom is to leave these areas of denudation to themselves. It is not only impractical to stitch over the affected field in its entirety, but actual observation has proved abundantly that adhesions between intestinal loops do not often affect the well being of the patients. As soon, however, as intestines or omentum become adherent to the uterus a train of unpleasant symptoms inevitably ensues. A pulling sensation in the upper part of the abdomen, gastrointestinal disturbances of various degrees, and more or less ill-defined pains occur, and even transitory ileus-like phenomena are not uncommon. On the part of the uterus, the abnormal attachment of loops of intestine with a varying amount of distention leads to decreased mobility of this organ and, in its further development, to menstrual disturbances. The continuous pull exerted by the structures above and behind may eventually force the uterus backward and may, in some cases, even undo the result of a previous antefixation operation.

Here, then, is the problem that confronts us. We have, for example, decided on a Gilliam operation or one of its numerous modifications or substitutes in a case of fixed retroflexion. We have broken the adhesions that held the uterus to the depth of the culdesac or the rectum. We have shortened the round ligaments and now behold the uterus lying in normal position but with a more or less extensive area of denudation upon its fundus which invites the speedy formation of new adhesions.

Or take, as a second possibility, the case of an inflammatory process in one of the tubes, which is rarely confined to the affected side but implicates the uterus as well. Shall we remove the diseased tube and ovary and close the abdomen without an attempt to peritonealize the raw fundus? Where a bilateral pyosalpinx of gonorrheal origin demands the extirpation of both tubes, my personal choice is a panhysterectomy, after which the covering of the entire field of operation with intact peritoneum is an easy matter. I am aware, however, that such radicalism, despite its well-established advantages, has not yet become a general practice and the question is still before us, how to protect the uterus from further harm, useless though it is as an organ after a double salpingectomy.

It is evident that these two categories of fixed retroflexion and of adnexal disease constitute a not inconsiderable percentage of our gynecologic

*Read at the Forty-fifth Annual Meeting of the American Gynecological Society, Chicago, May 24-26, 1920.

operations so that a method of covering the denuded uterus with intact peritoneum may lay claim to practical importance. The very sporadic efforts that have been made in the past have been rather discouraging. The Cargile membrane of R. T. Morris has never become popular, and the grafting of pieces of omentum first introduced into surgery by Senn, has been largely disappointing.

Yet, the difficulty is easily solved by a procedure, the various steps of which are as follows:

The fundus is grasped by a volsellum and pulled backward and upward in the direction of the promontory. The reflection of the bladder peritoneum upon the cervix, which now becomes plainly visible, is incised transversely as in a hysterectomy and pushed off from the uterus (Fig. 1). If this blunt dissection with the finger is gentle enough and does not extend into the

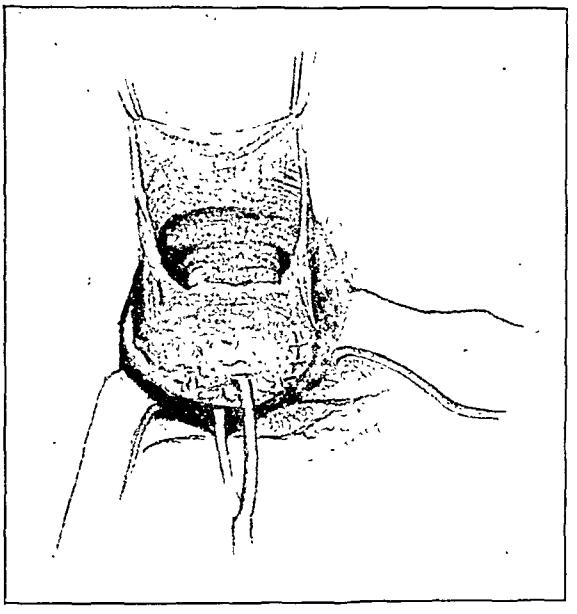

Fig. 1.—The bladder peritoneum has been pushed off the cervix and is held ready to be reflected across the fundus. Note the bladder in the depth of the wound.

broad ligaments, the bleeding is usually insignificant and is quickly checked by the pressure of a sponge. The uterus is then tilted forward, the bladder peritoneum is pulled over the uterus and stitched to the posterior aspect of the fundus where an intact peritoneal surface presents itself (Fig. 2). In small uteri, the bladder peritoneum may be fastened as far back as the insertion of the sacrouterine ligaments, if necessary. After the first few turns of this continuous catgut stitch, the volsellum is removed and the stitching is continued until the entire fundus with its denuded area has disappeared beneath its new peritoneal covering. By using an inverting stitch, even the catgut knots become invisible. The newly formed covering consists *only* of the bladder peritoneum which in many cases, is so thin and transparent that the raw uterine surface and even the volsellum holes may be distinguished.

The method just outlined not only supplies the raw fundus with a new serous coat, but it also safeguards a normal position and mobility of the uterus, and the late results have remained most satisfactory. It is, however, not to be relied upon in a case of fixed retroflexion. In such a case the order of the operative steps is this, viz., first, loosening of the bladder peri-

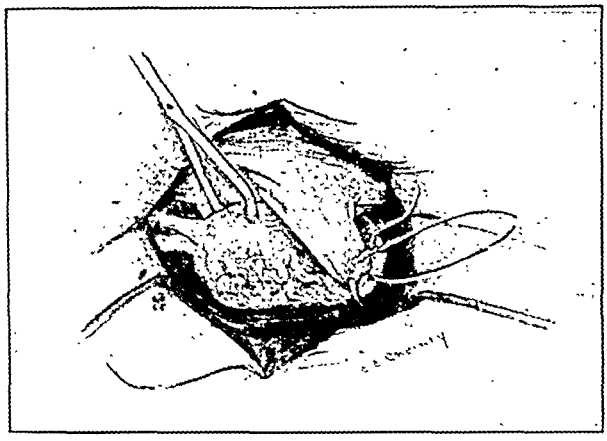

Fig. 2.—The apron of bladder peritoneum is being stitched to the posterior aspect of the fundus.

toneum as described above; second, shortening of the round ligaments; third, fastening of the bladder peritoneum to the back of the uterus beyond the area of denudation.

I anticipate two pertinent questions: "Is the function of the bladder disturbed after this procedure?" and, "What happens to the bladder in a subsequent pregnancy?" In the six or seven years that I have employed

Fig. 3.—A diagrammatic view of the postoperative conditions shows the relation of bladder and uterus unchanged. Hence no probability of vesical disturbances.

the method, I have *never* observed instances of vesical disturbance other than those that may follow any laparotomy. A moment's visualization of the condition created will supply the theoretical explanation of the absence of postoperative complications. The relations of the bladder and uterus are

not essentially altered. The uterus still lies on top of the bladder. Only the peritoneum which at this point is loosely connected with the bladder, is stretched and pulled across the fundus (Fig. 3). The bladder, at the border of posterior and upper walls, may adhere to the uterus a little higher than normally, but still on its anterior aspect. Hence, the filling of the bladder with urine will cause neither subjective nor objective disturbances.

The same freedom of the bladder obtains in pregnancy when the gravid uterus may rise into the abdominal cavity without dislocating the bladder much more than is the case normally. I have seen one case that terminated in a miscarriage after four months. This patient at no time complained of vesical symptoms.[1] None of my other private patients has conceived thus far. I have no knowledge whether any of my hospital patients had become pregnant because our follow-up system is as yet undeveloped. Theoretically, the probability of pregnancy in the class of cases concerned is not very promising. Pathologic changes within the uterus that may have become permanent, alterations in the functions or structure of tubes or ovaries, azoospermia in the husband—all these factors may militate against conception.

The plan of preventing uterine adhesions is so simple and so self-evident that I doubt not but that others may have invented the method for themselves. In any event, I submit it to your consideration in the conviction that it will still further increase the efficacy of our gynecologic operations.

METROPOLITAN BUILDING.

(*For discussion, see p.* 310.)

[1]NOTE. Since writing the foregoing, a second patient on whom this procedure was done after the enucleation of several fibroids, has conceived. She is now (November, 1920) about four months' pregnant and has had no bladder symptoms of any kind.

LUTEIN CYSTS ACCOMPANYING HYDATIFORM MOLE*

By W. A. Coventry, M.D., F.A.C.S., Duluth, Minn.

From the Duluth Clinic

INTRODUCTION

THE opportunity to have observed two cases of large bilateral multilocular lutein cysts accompanying hydatiform mole prompted a review of the textbooks and other literature at my command. The fact was thus brought to my attention that these cases are comparatively rare, and therefore are of sufficient importance to warrant this report. The bulk of the literature relating to conditions of this kind is given to a discussion as to the cause and relationship of mole and chorion epithelioma and very little to large bilateral multilocular cysts, which in a very small proportion of cases seems to accompany only mole or its related disease, chorion epithelioma. Previous to 1905, the literature, although containing reports of similar cases, does not go into detail or attempt any explanation as to the possible cause or formation of these cysts, whether of the large, fast growing type or of the ordinary corpus luteum cysts.

In 1905 Patellani reported 68 cases of chorioma in which bilateral cystic changes in the ovaries occurred in 62 cases, or 91 per cent. However, his record does not attempt to show, so far as I am able to ascertain, whether these cystic changes in the ovary were of the large multilocular type similar to those found by myself.

Findley reports only 58 cases out of the 500 cases of chorioma and mole that he was able to review. What percentage of them were of the pathologic type of cyst I am not able to ascertain.

Paul Bar reports one case of large bilateral corpus luteum cyst accompanying chorioma and believes that when this combination occurs one should do a hysterectomy. He also thinks that these ovarian cysts continue to develop after removal of the mole.

Schwarz reports a case accompanying chorion epithelioma and his description of these tumors corresponds very much in detail to those seen by myself.

Wallert, in 1908, collected several cases of pregnancy in which he found cysts almost as large as in a certain case of chorioma, but he neglected to state how large these cysts were, and therefore his observation, so far as the report is concerned, is not of much value.

ETIOLOGY

Stoeckel, in 1901, showed that many of these cysts are developed from the corpus luteum and are accompanied by a more or less diffuse infiltration of the ovary with lutein cells, from which multiple cysts probably arise. However, he was not able to definitely prove his case.

*Read at the Forty-fifth Annual Meeting of the American Gynecological Society, May 24-26, 1920.

Seitz, in 1906, gave us our best interpretation as to the cause of these cysts, when he said that the origin of the cyst could be attributed to the atresic follicles of the ovary and attempted to prove that the hyperplasia of these follicles is quite different from those of a true corpus luteum. He thus drew a distinction between cysts of the true corpus luteum and the polycystic conditions found in mole and chorioma. He also attributed the great size of these cysts to some mechanical factor, as a venous congestion from adhesions, chronic nephritis, etc.

Ewing, commenting on Seitz's observation says: "The chief origin of the multiple cysts may be from the atresic follicles. Seitz's argument that the condition in the ovaries in chorioma or mole has no other significance than that of a slightly exaggerated normal process, is plainly defective. The astonishing grade of cystic degeneration common with mole is not duplicated in any other condition and mechanical factors cannot be held responsible for this change." He also adds "In view of all facts and the occurrence of peculiar bilateral cysts of the ovaries in at least 91 per cent of cases of chorioma, it is difficult to escape the conclusion that there is some essential relationship between chorioma, mole and these polycystic conditions of the ovaries."

HISTOLOGY

These cysts undoubtedly come under Class IV of Ewing's classification, in which he says they are cysts lined by lutein cells, covered by cylindrical, cuboidal or flat epithelial cells. The walls of these cysts are very thin (almost translucent) and may contain a clear, limpid fluid, sometimes bloody and sometimes containing gelatinous clots.

Somewhere I have read that these cysts were probably retention cysts with fluid coming from the secreting lutein cells, or possibly an exudate of serum from adjoining vessels.

Schwarz feels inclined to derive the lutein cells in his case from theca cells and found in many places numerous islands of these cells scattered in the stroma, showing no signs of degeneration. On the other hand, the cells lining the cyst cavities are undergoing retrogressive metamorphosis.

Schaller, Pfoerrinder, and some others, express the view that the lutein cystomas might be a carcinomatous degeneration of lutein cells. However, the rapid growth of these tumors is no sign of malignancy in the cells themselves. So far, nobody has been able to find any evidence of malignancy in these tumors. Some one has suggested that the smaller cysts in the ovaries were probably preceded by hemorrhage into the follicles, which in some way leads to an excessive production of lutein tissue and subsequently these cysts become distended by a secretion from the cells themselves.

Eden and Lockyear in their textbook, are inclined to believe that these tumors come entirely from the theca cells of the ovaries.

CLINICAL HISTORIES

CASE I.—Mrs. J. A. P. Aged twenty-two. Para, II. Presented herself Oct. 3, 1916, with a history of having had a forceps delivery two years previously, which evidently had been a very hard one as at that time the vulva had been torn loose from the pubes, the cervix and perineum badly lacerated. The last

menstruation was June 12, 1916, about four months before she came under observation.

Examination at that time showed an extremely anemic woman with a rather marked dilatation of the heart as a result. Vaginal examination showed her uterus enlarged to about a four months' pregnancy, freely movable, and not much, if any pain, on motion. Abdominal examination, however, showed the presence of free fluid and on both sides of the uterus could be felt large masses, which seemed to be cystic in nature. Examination of the chest was negative for tuberculosis.

The patient gave a history of bleeding for the last three months, and during the past week had had several uterine hemorrhages, but has not passed any material from the uterus.

I made a diagnosis of tuberculous peritonitis complicating pregnancy.

Our decision was to operate for the peritonitis and allow the patient to abort spontaneously. A median incision made above the umbilicus immediately disclosed a large amount of fluid, containing gelatinous clots. Further exploration revealed a very large multilocular cyst of each ovary with very distinct pedicles; no adhesions. The tumors were removed and the wound closed in the usual manner.

Postoperative examination of the tumors showed them to be made up of multiple cysts, each tumor being about the size of the adult head. The cysts were translucent and so exceedingly thin walled that when lying upon the tray the serum seemed to ooze through the walls. On section, they contained a straw colored material, which was slightly blood tinged, and some gelatinous clots. Nowhere could any evidence be found of tubercles.

The diagnosis was made of bilateral multilocular lutein cysts of the ovary.

The following day the patient aborted a portion of a hydatiform mole of the characteristic consistency, shape and appearance. Patient was again anesthetized, the mole removed with forceps, and the uterus packed with gauze, no curette being used.

Patient made an uneventful recovery and is alive at this date with no evidence of chorion epithelioma.

CASE II.—Differs somewhat from Case I in several clinical features. This patient came under observation three months later, in December, 1916. Thirty-one years of age. Para VII. The last menstruation had been two months' previous to coming under my observation. The youngest child was ten months of age and she had nursed it for eight months.

She had flowing for two weeks. No particular pain but no brisk hemorrhage. Vomiting had persisted since the last menstruation.

The urine gave a marked reaction for diacetic acid.

Her condition was treated as one of pregnancy with accidental hemorrhage, and two weeks later the patient was again examined. This time the uterus had enlarged from the size of a two months' pregnancy to that of practically one of five months.

A diagnosis of mole was made and the mole was removed under anesthesia with placental forceps, but no curetting. Having in mind the previous case, a painstaking search was made for possible cysts of the ovary, but none could be found.

One month after the removal of the mole, the patient in the meantime having gone to another city on a visit, she presented herself for examination, which revealed the uterus to be rather enlarged and retroverted, but now, in the abdomen could be felt two large tumors, each about the size of one's fist. They were fairly hard and did not feel cystic. However, in view of the previous case, a diagnosis was made of bilateral cysts of the ovaries, with a possible chorion epithelioma developing. Operation was advised and accepted, and I found both

ovaries slightly larger than my fists, containing multiple thin-walled cysts. No free fluid in the abdomen. The uterus was large and flabby, about the size of a two months' pregnancy. There were no apparent signs of chorion epithelioma, but having this in mind, a hysterectomy was done, with the removal of both ovarian tumors. The wound closed in the usual manner, and the patient made an uneventful recovery, and to this date is strong and well, with no evidence of any recurrence.

Microscopic examination of the uterus, after very diligent search, showed no evidence of chorion epithelioma. Examination of the cysts showed the same character of cysts as found in the previous case, though they were not so large. The fluid contained was straw-colored and slightly bloody in appearance.

Postoperative Diagnosis: double multilocular lutein cysts of the ovaries; subinvolution of the uterus.

COMMENT

These two cases present several very interesting features:

1. The appearance of the ovarian tumors, in one case appearing with the mole (in fact, clouding somewhat the history of mole), and in the other case seeming to arise and starting to grow rapidly after the mole had been removed.

2. The gross and microscopic appearances of these cysts are in marked contrast to those of the ordinary type of ovarian cyst.

3. These multiple lutein cysts are beyond a doubt different from those normally appearing during pregnancy.

4. These lutein cysts undoubtedly accompany only the formation of chorion epithelioma and mole and are probably not to be found in any associated condition.

There are many references in the literature as to the occurrence of cysts of the ovaries accompanying pregnancy, mole or chorioma, but I am sure that many of these references are only to small cysts, which disappear spontaneously after explusion of the mole or the fetus, as the case may be. From the appearance of such large cysts as here described, and described elsewhere in the literature, I believe this to be an uncommon condition.

DIAGNOSIS

Here, as in the first case, one must differentiate between the presence of tuberculous peritonitis. The presence of ovarian tumors with mole, or history of mole having been expelled, should lead one to suspect the formation of these tumors.

PROGNOSIS AND TREATMENT

Eden and Lockyear assert that some of these cysts recede after the expulsion of the mole, and such cases have been recorded by Russell, Andrews and Albert, but this literature is not available. Findley comments that occasionally cystic ovaries become greatly reduced in size following delivery of the mole and reports in the 58 cases collected by him that in only four was there any retrogressive change following the expulsion. Still, he does not specifically state that these were large lutein cysts such as described in this condition.

In view of the fact that the literature in the large majority of cases connects this condition with the presence of chorion epithelioma, and also in view of the fact that the condition is undoubtedly a retrograde metamorphosis from the normal cystic conditions found in the ovary, I believe that we are perfectly justified in not waiting for the recession of these tumors, but that we should operate and remove them when found. The small cystic tumors of the ovaries, accompanying mole, I would be inclined to keep under observation. Whether we should do a hysterectomy at the same time as the removal of the tumors, remains an open question.

LARGE OVARIAN CYST WITH TWISTED PEDICLE COMPLICATING PREGNANCY

By Carter S. Fleming, M.D., Fairmont, W. Va.

THIS patient was referred to the writer at Cook Hospital, August 1, 1920, by F. W. Hill of Montana, W. Va., with a diagnosis of acute intestinal obstruction complicating pregnancy.

Mrs. B., Polish. Married seven months. Age twenty-eight. Housewife. Chief complaints, abdominal pain, weakness, shortness of breath and headache. Family history uneventful.

Patient has had no operations and no serious adult illnesses. States that, with the exception of dyspnea, she felt well two days ago until she ran down a rather steep hill to catch a train. While running she felt something "slip" in her abdomen and experienced an acute pain in the left lower portion of the abdomen. She visited in Fairmont for several hours, during which time she had no pain, and returned home in the evening. During the night the pain recurred with increased severity, being cramp-like in character. She took a large dose of castor oil. The following morning, August 1, the pain was still worse, no bowel movement had occurred, and Dr. Hill was called to see her. Dr. Hill states that her abdomen was markedly distended, her respirations rapid and difficult, temperature 101° F. and pulse 110. A soap suds and turpentine enema was given with no results. A vaginal examination revealed the uterus forced down into the pelvis by pressure from above. The woman was advised to enter the hospital at once, but she preferred to wait for several hours. Several more enemas were given with no results. During the afternoon the pain was increased, no bowel movement had occurred, and she agreed to enter the hospital.

Menstruation began at thirteen; regular, 28-day type, lasting five days. Her last period began on February 25, 1920.

Patient states that she is five months' pregnant, which pregnancy is her first. Bowels have always been regular and moved last on July 30. Micturition has been normal. No vaginal discharge.

Examination upon admission to Cook Hospital, August 1, 1920, at 6:00 P.M., revealed the following: Well nourished young woman complaining severely of abdominal pain and difficulty in breathing. Very pale. Tongue

dry and coated. Heart and lungs negative. Mammary glands show usual changes of pregnancy. Abdomen longitudinally ovoid and rather symmetrically enlarged except for a slight transverse depression just above the umbilicus. At a glance the abdomen resembles a pregnancy at term, or past term. Circumference 92 cm. The abdomen is markedly distended and tense and there are no palpable masses such as fetal parts, etc. The anterior portion is dull on percussion; the sides tympanitic. The intraabdominal tumor reaches to the costal margins and interferes with the patient's respiration. Vaginal examination shows a nulliparous outlet with slight edema of the labia. The vaginal mucous membrane is cyanosed, cervix soft and patulous. Uterus is considerably enlarged and forced down into the pelvis by pressure from above. Ballottement of any uterine contents is impossible. Slight edema of feet and ankles present. Temperature, 102° F.; pulse, 120; respiration, 34; white blood cells, 35,000; polynuclears, 96 per cent; hemoglobin, 70.

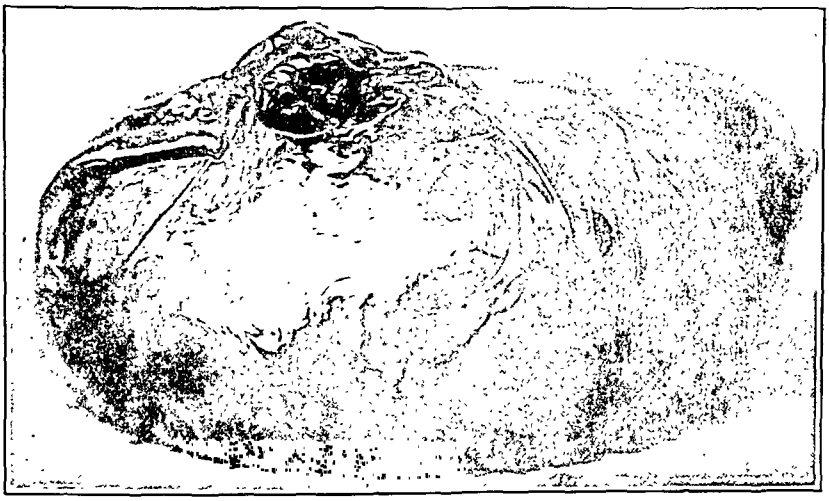

Fig. 1.—Ovarian cyst weighing twelve pounds, complicating a five months' pregnancy, showing enlarged tube spread out over tumor and blood clot at site of pedicle.

The grave condition of the patient indicated immediate operation for the relief of the obstruction without further attempts at making a definite diagnosis although several possibilities were considered, viz., intraabdominal hernia, strangulated tumor, concealed hemorrhage, etc. Operation done August 1, 1920, Cook Hospital, under nitrous oxide, oxygen and ether. Abdomen opened by fairly large incision through the right rectus, with the center at the umbilicus. Abdomen contained a moderate amount of free dark-colored fluid and was occupied by a large dark ovoid tumor resembling a uterus at term which was not adherent. The tumor evidently contained fluid, but was very tense. It was found to be pear-shaped and attached to the left horn of an enlarged uterus by a pedicle which was twisted twice. The uterus corresponded in enlargement to the supposed five months' pregnancy and was dark and mottled in appearance. Twenty-five hundred c.c. of dark fluid were removed from the tumor with a trocar, then its pedicle was clamped and the tumor removed easily and quickly. The pedicle was carefully ligated in three portions and,

without disturbing the uterus, the abdomen was closed in the usual manner. The operation consumed about twenty minutes and the patient was removed from the table in good condition. She was given sodium bicarbonate and glucose solution per rectum and morphine in small doses. She vomited only once. Peristalsis was established promptly and she passed gas readily. The bowels were moved by enema the following morning. Temperature dropped promptly to normal. It was hoped that her pregnancy would continue to term, but uterine contractions began in forty-eight hours after operation and a fetus measuring about 24 cm. in length was expelled. The placenta was removed easily six hours later. There was no excessive bleeding. The fetus was not macerated and had evidently died recently. There were no post-operative complications and the patient left the hospital on the twelfth day in excellent condition.

Examination of the specimen showed a large ovarian cyst with very rich blood supply. The tube was spread out over the surface of the tumor. Rather large blood clot in the tumor wall just above the twisted pedicle. When refilled with the 2500 c.c. of fluid removed during the operation, it weighed 12 pounds. Size 33 x 26 cm., circumference 82 cm. The outer surface of the tumor was smooth and showed that there had been considerable hemorrhage into the wall. Section showed the tumor to be unilocular. The inner wall was rather granular in appearance and also showed extravasation of blood into the wall. There was evidently some hemorrhage into the lumen of the cyst. Fig. 1 shows the cyst and especially the blood clot above the twisted pedicle.

Examination of the fetus showed no abnormalities. The placenta presented one small white infarct and minute hemorrhages into the amnion of the placenta and cord.

PROFESSIONAL BUILDING.

CANCER OF THE UTERUS IN YOUNG WOMEN*

By Gordon Gibson, M.D., F.A.C.S., Brooklyn, N. Y.

From the Department of Obstetrics and Gynecology of the Long Island College Hospital

MALIGNANT disease of the uterus in women under thirty is of sufficient rarity to warrant a report of the following cases. One of these came under the care of Dr. Polak, one of Dr. Beck, and four of the writer.

It has been so long taught that cancer of the uterus occurs about the time of the menopause that, unless one is alive to the fact that it can occur at any age, an early case in a young woman may be overlooked because the "condition present was not considered."

It is only by continued repetition of the teaching that any undue vaginal discharge, bloody or not, demands investigation, with cancer in mind, and that any cervix which bleeds easily on examination or which shows any friability, should be considered as possibly malignant until proved not to be by microscopic examination, that this process can be controlled.

The writer cannot resist stating here that he believes that in a case where the diagnosis is clear, clinically, one in which there is a definite growth of the cervix, it is better not to wait for a microscopic report, but to operate immediately, as it has been his experience recently to see the process destroy the cervix and invade the parametrium during the week elapsing between taking the specimen and receiving the report. If, however, the services of a laboratory, properly equipped to make frozen sections, are available, this difficulty may be obviated.

Peterson[1] in a recent study of 500 cases of cancer of the uterus, found 23, or 4.8 per cent, of his cases under thirty years of age. Our percentage is higher, being 6 in 61 cases studied, or 9.9 per cent. This percentage will in all probability decrease as the series is extended. The value of statistical study is open to question. It is not so important how often cancer of the uterus can occur under thirty, as it is important to know that it does occur at that age.

No attempt is made in this report to discuss the results of treatment as the result of any method of attack of this disease does not so much depend on the method as upon the condition found. In other words, any operation, either abdominal or vaginal, which removes all the infiltration of malignant growing cells, will cure the patient, while any operation, either abdominal or vaginal that does not remove all diseased tissue, is a failure in that particular case. It is true that in some hands, more of the parametrium can be removed after isolation of the ureters by the abdominal route than by the vaginal method. Preliminary radiation should be carried out, if possible.

Case 1.—Mrs. A. F., age twenty-five, admitted to the Gynecologic Service of the Long Island College Hospital on April 4, 1915. Her menstruation began at twelve, was regular

*Read before the Section on Obstetrics and Gynecology of the New York Academy of Medicine, January 27, 1920.

every twenty-eight days and of three or four days' duration. She married at eighteen and had two children, three years and sixteen months of age. There had been a rather profuse leucorrheal discharge for the past ten years. Four months before admission, this discharge began to be blood stained on defecation and straining and had lately become very profuse. On admission the woman was very anemic and emaciated. Her blood showed 3,090,000 red cells with 44 per cent hemoglobin. The vagina was found entirely filled with a foul necrotic mass which was presenting at the introitus. The vulva and inner surfaces of the thighs were badly excoriated. On April 6, this mass was curetted away and the resulting crater cauterized with the electric cautery. The pathologic report was epithelioma. On April 27 the vagina was again almost filled with a cauliflower mass and the parametrium was badly infiltrated. She was again anesthetized and as much of the mass removed with the cautery knife as possible. On April 30, 50 mg. of radium were inserted and allowed to remain 24 hours. This was repeated on May 4, when again it was found that the growth was almost filling the vagina. She failed steadily and died on June 6, 1915. At autopsy the entire pelvis was filled with infiltrate.

CASE 2.—Mrs. M. S. Admitted to the service of Dr. Polak on Feb. 15, 1918. Age twenty-eight years. One sister died of cancer of the uterus at the age of thirty-one and her mother died of the same disease at the age of fifty-two. Her menses began at eighteen, were regular every twenty-eight days and of three days' duration. She married at seventeen and had three children, ten, eight, and three and one-half years of age. Her labors and puerperal periods were normal in every way. She had one miscarriage six years ago which was uncomplicated. Examination showed the cervix to be considerably enlarged and to be the site of a cauliflower growth of moderate size. There was some thickening of the left parametrium. On February 16 a radical abdominal hysterectomy was done. She left the hospital on March 8 with no evidence of infiltration.

CASE 3.—Mrs. L. G. Age twenty-nine years, colored, a patient of Dr. Beck's, was admitted to the hospital on Aug. 4, 1918. Menstruation began at fourteen, was regular every twenty- eight days and of two to three days' duration. She married at sixteen, and bore two children, now thirteen and eleven years of age, respectively. Both labors and puerpera were normal. She stated that she had noticed a general lowered vitality for the past few years. She had never had a leucorrheal discharge until two months before admission, when she noticed a foul watery discharge and at the same time, an occasional blood staining at coitus. Examination showed a small area of hyperemia in the middle of the posterior quadrant of the cervix. This area bled easily on examination. On August 6, Dr. Beck did a radical abdominal hysterectomy. The disease has recurred and the patient is now in a home for incurable cancer.

CASE 4.—Mrs. N. Admitted May 12, 1919. Age twenty-seven years. Her previous history is unimportant. She married at seventeen and had two children, the last four years before admission. She was perfectly well until January, 1919, when she noticed a bloody vaginal discharge on exertion. This increased in amount, she began to lose weight and grew progressively weaker. The vagina contained a large cauliflower mass and the parametrium was infiltrated to such an extent that no radical procedure could be carried out. The growth was curetted away the next day and the resulting crater cauterized. The pathologic report was epithelioma. She subsequently received two doses of 100 mg. of radium for twenty-four hours each, but the infiltration increased rapidly and she died in November.

CASE 5.—Miss H. Admitted June 3, 1919. Age twenty-eight years. Single. There was no history of cervical trauma obtainable, but there was some doubt in our minds about this. She was well until her period in December, 1918. Following this period, which began on the 27th, there was a constant bloody discharge which gradually increased in amount. She was admitted with a temperature of 103° and a pulse of 110, very anemic and septic. There was a large necrotic mass filling the vagina and the entire pelvis was infiltrated, being palpable above the pubes. A considerable amount of pus was evacuated from the cervix during the examination. It was thought that her general condition could be improved and she be made more comfortable if we provided drainage, so on June 6, as much of the mass as possible

was removed with the cautery knife. The pathologic examination showed epithelioma. She died three days later.

CASE 6.—Mrs. R. Admitted Sept. 15, 1919. Age twenty-five years. She had always been a strong and robust girl. She was married at twenty-three and had one child on Feb. 19, 1919. The labor and puerperium were normal. She menstruated normally in June. On July 8, one month later, she began to flow and continued to do so in varying amounts up to the time she was seen. Examination revealed a mass slightly smaller than an English walnut, slightly pedunculated, rather firm in consistency but which bled profusely at touch, springing from the posterior edge of the cervix. The cervix itself was intact and freely movable and there was no palpable thickening of the parametrium. On Sept. 16, we did a vaginal hysterectomy, removing a considerable cuff of vagina. The pathologic report was epithelioma. The vault filled in rapidly with healthy granulations and she received two applications of 75 mg. of radium of 24 hours each on Oct. 9 and 22. She was seen one month ago and her pelvis shows no evident return of cancer.

One of the striking points in these histories is the fact that the first four cases all married early, at nineteen, seventeen, sixteen, and seventeen. Of the five who have borne children, four developed their cancer comparatively soon after a pregnancy, sixteen months, three and one-half years, four years and five months.

In only three of the cases could a radical procedure be carried out with any hope of success, and in these the disease had given rise to symptoms for a comparatively short time, three months, two months, two months respectively, and in the first there was beginning infiltration into the parametrium.

In the others only a palliative operation could be thought of and all of them died shortly afterwards. In these the symptoms had been present for four months, five months, and six months, respectively.

CONCLUSIONS

1. Cancer of the cervix occurs with sufficient frequency in young women to make it imperative that the condition be kept in mind.
2. Epithelioma is the type generally found.
3. The growth is much more rapid than in older individuals and only when seen in the first three months can a radical operation be done.
4. The extension is especially rapid when the parametrium becomes involved and death follows comparatively soon.

REFERENCE

[1]Petersen, R.: Age Distribution and Age Incidence in 500 Cases of Cancer of the Uterus, Surg., Gynec. and Obst., xxix, 544.

176 STATE STREET.

GLYCOSURIA DURING PREGNANCY*

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I HAVE been stimulated to write upon this subject because of the untoward results recently observed in the treatment of two cases of diabetes mellitus in the Obstetric Clinic of the University Hospital. Not since the year 1908 has this complication been given serious consideration by any American obstetrician. At that time J. W. Williams reviewed the literature and considered at length the various types of glycosuria.

J. Matthews Duncan was probably one of the first to interpret correctly the findings of glucose in the urine during pregnancy. In a paper on puerperal diabetes read before the London Obstetrical Society, he reported twenty-two pregnancies occurring in 16 women who had become pregnant while suffering from diabetes or had developed the disease while pregnant. Eleven, or 68 per cent of these women died within the following two years as a result of the disease, while 47 per cent of the children were lost. Offergeld in his monograph of 1913 reports sixty-three such cases with an estimated maternal mortality of 50 per cent and a minimum fetal mortality of 66 per cent, 56 per cent being stillbirths and another 10 per cent dying during the first few days of life. Joslin, however, in a recent paper has taken a much more optimistic view of the complication, although both his maternal and fetal deaths in the moderate and severe cases approach those of Duncan and Offergeld. From these statistics and those of the state of Massachusetts, which show that the frequency of diabetes has more than doubled within the past ten years, we can see that the disease is an important one to recognize.

In a review of 2,200 consecutive cases of the Obstetric Department at the University Hospital (Ann Arbor), where the patient's urine is examined at least once every week, I have been able to find cases of lactosuria and almost every type of glycosuria. Only in those urines in which there was a definite reduction of Fehling's solution, was sugar recorded by the examiner as being present. Of these 2,200 cases, 88 gave a test for some form of sugar during either pregnancy, labor or the puerperium, a frequency of 4 per cent, somewhat lower than the 5.57 per cent of Williams and the 10 per cent reported by von Noorden. The incidence in the several periods was as follows: pregnancy 68, or 77 per cent; puerperium 14, or 11 per cent; and pregnancy and puerperium 6, or 7 per cent. The reaction was found much more frequently in primiparæ, 75 per cent, than in multiparæ. This can be explained by the fact that almost 80 per cent of our patients were going through pregnancy for the first time. The relatively low percentage during the puerperium can be explained by the fact that frequently during the puerperium no urinalysis was recorded. The earliest appearance of sugar was the sixth month, except

*Read in abstract at the meeting of the Michigan State Medical Society, May 26, 1920.

in those cases of true diabetes, where the sugar was present either before or very early in pregnancy. In the majority of cases, however, the test was not positive until two weeks before labor.

I now wish to present from the records of the University Hospital several typical cases and a number of conditions which may be confused with true diabetes, and after a brief discussion of each case and a review of the literature, to attempt to draw certain conclusions of practical value.

LACTOSURIA

CASE 1. (O. B. No. 338).—Lactosuria in a primipara, age twenty-three, in excellent health, who four weeks before labor and six days postpartum gave repeated tests for sugar in her urine. At no time did this urine ferment or rotate the polariscope in the proper direction for grape sugar. Her labor was spontaneous and she gave birth to a normal full-term child.

There is no doubt that a certain percentage of all pregnant and puerperal women have some form of sugar in the urine. This in most cases is in the form of lactose, or milk sugar, and is due to a premature activity or engorgement of the breasts. In 3.5 per cent of the 2,200 cases it was found during pregnancy, the large majority of cases giving the test two weeks before the onset of labor. Wilcox has a somewhat lower percentage for the same findings, namely, 1 per cent, while Ludwig places the same at 46 per cent and, when the puerperium is included, Commandeur and Porcher have found lactose in 30 consecutive cases. During the puerperium lactosuria is most common especially at the time of engorgement of the breasts and again during the weaning period. Then the percentage of milk sugar excreted may approach 10 or even 25 per cent. In none of these uncomplicated cases has Schiller been able to demonstrate any increase in the blood sugar.

ALIMENTARY GLYCOSURIA

CASE 2 (O. B. No. 44).—The next is a case of alimentary glycosuria in a young girl, age twenty, who complained of no symptoms other than some frequency of micturition with passage of large amounts of urine. She was in the habit of eating considerable quantities of candy as well as drinking much water. The urine showed a specific gravity of 1,033 and one month before labor repeatedly reduced Fehling's solution and responded to the fermentation test. With a restriction of carbohydrates her urine became sugar free. She was delivered of a normal full-term child and went through an uneventful puerperium.

It is a well-recognized fact that the pregnant woman is less tolerant to carbohydrates than the nonpregnant woman. As has been demonstrated in this case, by simply reducing the carbohydrate intake, the sugar in the urine disappeared and remained absent following delivery. Norris has shown that in 37 per cent of pregnant women, there is a certain susceptibility to alimentary glycosuria, so that an ingestion of 60 grams of glucose will produce a glycosuria. There is, as Schiller and Slemons have demonstrated, no hyperglycemia, but rather a low sugar tolerance due to either an increased adrenalin, thyroid or hypophysis function, or a lowered ovarian function, or it may be explained by an increased function of the liver, the result of placental ferments and elimination of fetal products as suggested by Reinhardt and McDonald. A few of these cases may actually be diabetes, the glycosuria be-

ing due to a very mild diabetes and evidencing itself only during pregnancy when diabetes is most liable to occur. The majority have none of these symptoms or findings of true diabetes and practically all of them clear up immediately after delivery. The important point in connection with this condition is to realize that it does occur and that when glucose is found in the pregnant woman it does not necessarily mean diabetes.

RENAL DIABETES

CASE 3 (O. B. No. 163).—A primipara, age thirty-five, who gave a history of nephritis with hypertension and angiosclerosis of the retinal vessels. The urine reacted for glucose two weeks before delivery and her blood sugar repeatedly was found to be 0.158 per cent, the upper limit of normal. She had at this time 2 grams albumin per litre and a blood urea of 0.0384 grams per 100 cubic centimeters. Her sugar excretion was uninfluenced by diet. The labor was uneventful except that she delivered herself of a macerated fetus with an accompanying infarcted placenta.

Renal diabetes was diagnosed in this case because the blood sugar was always within the limits of normal and her glycosuria uninfluenced by either increasing or decreasing the carbohydrate intake. She had none of the symptoms of diabetes mellitus. The most recent work by Foster and earlier work by Mann on the sugar content of the blood in these renal diabetics have proved that there is no hyperglycemia present. In none of these cases were they able to find more than 0.15 per cent. It is also interesting to note that this condition may recur during successive pregnancies while during the interval the urine is normal. Occasionally, the glycosuria may alternate or be combined as in this case with albuminuria. The amount of sugar excreted is rarely above 15 grams per day.

As yet no satisfactory explanation has been offered for this remarkable phenomenon. It is peculiarly characteristic of pregnancy and may be, as Nowak, Porges and Strisower have suggested, due to a hypersensitiveness of the kidney to glucose or it may be the result of a phloridzin-like substance as suggested by Caldwell and Bibb.

DIABETES MELLITUS AND SYPHILIS

CASE 4 (O. B. No. 2144), is one of diabetes mellitus due to syphilitic pancreatitis. This patient is a primipara, age nineteen, who became pregnant in July, 1919. Her family and personal histories up to that time are entirely negative. In December of that year she consulted the Detroit Board of Health because of a measles-like eruption over her entire body. There a diagnosis of lues was made and antisyphilitic treatment advised. Accordingly arsphenamine and mercury were administered. Following one of these treatments a routine urine examination showed glucose in moderate quantities. This was her first knowledge that she had any such condition as diabetes. She was then advised to enter the maternity clinic and did so on February 7. A physical and laboratory examination corroborated the diagnosis of syphilis. A general adenitis, pigmented scars on the right labium and a positive Wassermann were found. The uterus was enlarged to the size of a six months' pregnancy and the fetal heart was heard in the right flank. Chronic gonorrhea was also demonstrated.

The relationship of the glycosuria, blood sugar, diet and intravenous arsphenamine are indicated in the accompanying chart. The glycosuria and blood sugar had a tendency to drop simultaneously with the lowering of the carbohydrate intake and the arsphenamine injections.

On February 12, she was delivered of a seven months' stillborn fetus, which had died during labor. At this time she presented the only signs of acidosis. Her urine contained both acetone and diacetic acid in appreciable quantities, but no sugar. There was no hyperglycemia. During the first two weeks of her puerperium the diet was unrestricted. Consequently sugar appeared in her urine on the fifteenth day postpartum and the blood sugar ascended to 0.153 per cent. With a resumption of a low carbohydrate diet and antiluetic treatment both sugar findings returned to normal.

During the entire puerperium there was present an elevated temperature with tenderness and rigidity of the lower abdomen. About three weeks postpartum this complication had subsided sufficiently so that she could be transferred to the Department of Dermatology for further antiluetic treatment. Five weeks postpartum she suddenly developed symptoms of peritonitis which was diagnosed as due to a pelvic abscess. At this

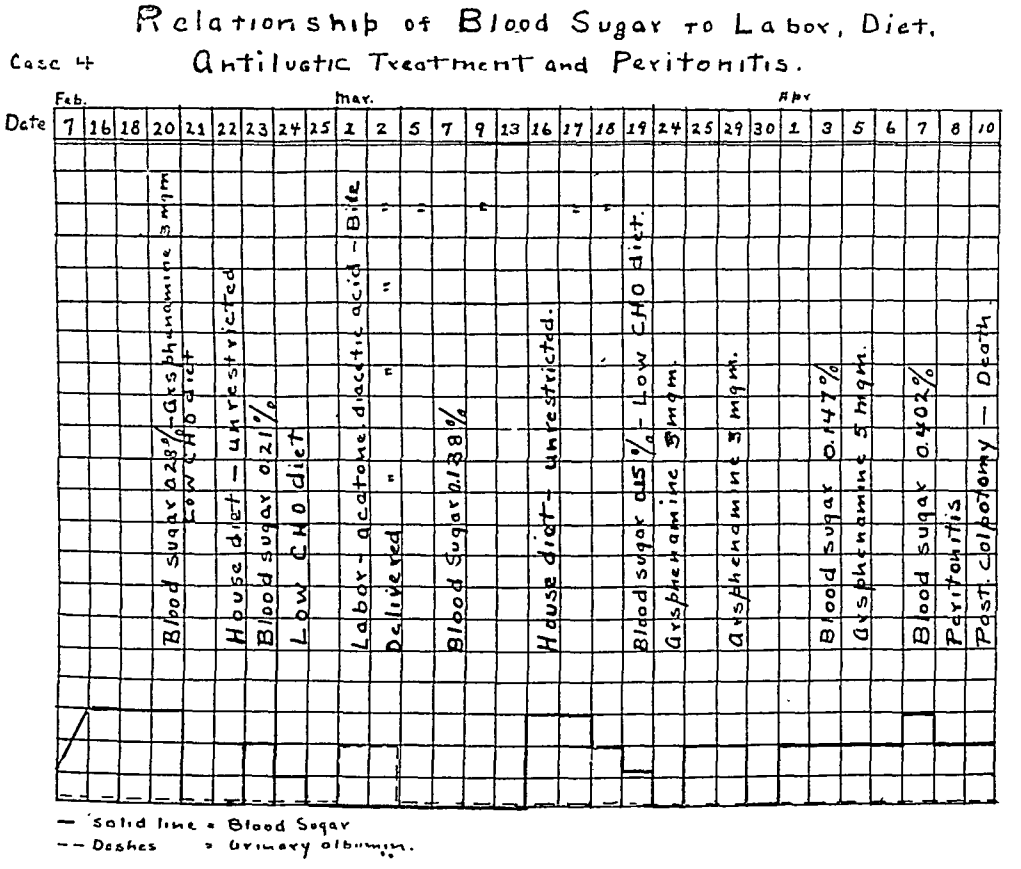

Fig 1.

time both her blood and urinary sugars were greatly elevated, but because of her critical pelvic condition, a posterior colpotomy was performed. She died about eighteen hours later with the symptoms of peritonitis rather than those of diabetic coma. At autopsy the diagnosis of death due to an old general peritonitis and a recent ruptured tubo-ovarian abscess was confirmed.

The premature labor with a stillborn fetus may have been due to both the diabetes and the syphilis. Since the placenta showed no positive signs of syphilis, and although the liquor amnii contained no sugar, and there was no hyperglycemia of the fetus, nevertheless, the type of labor with a living fetus just prior to delivery suggests that the fetal death was due to diabetes.

Certainly the indications in this case were to control the diabetes by two

definite lines of treatment; namely, dietary and antiluetic—the tolerance to carbohydrates being raised by the former, and the syphilitic involvement of the pancreas being limited but not necessarily repaired by the latter. The elevation of the final blood sugar can be explained by the general peritonitis and exhausted condition of the patient just before death.

In reviewing this history one might think that the puerperal fever in this case was definitely related to the ideal culture medium afforded by the glucose in the blood. Such is doubtful and can be better explained by an exacerbation of the old chronic gonorrhea from which she suffered earlier in her pregnancy. It is planned to report this case in greater detail from another point of view at some future date.

DIABETES MELLITUS

CASE 5 (O. B. No. 1031).—A mild type in a multipara, age thirty, who was admitted to the Obstetric Clinic, October 4, 1914. In 1910 she had one miscarriage of two months' duration, cause unknown. She has one living child four years old. For the past three years there has occasionally been sugar in the urine, but never of an amount sufficient to necessitate dieting. On admission to the clinic the history and examination showed that she was in her last month of pregnancy. The fetus was lying in the left occipito-anterior position and the fetal heart was heard to the left and below the umbilicus. There was a moderate edema of the ankles.

The urine was examined and both albumin and glucose demonstrated. The former disappeared the following day and did not reappear until the day of labor. The specific gravity was 1,054, sugar, 136 grams per liter or 17 per cent per 24 hours, with acetone++ and diacetic acid + +. The tolerance to carbohydrates was then determined by placing the patient first on a von Noorden diet, then adding bread until it was found that she could utilize 200 grams per day without excreting sugar in her urine. As a result the specific gravity descended, the sugar and diacetic acid disappeared in five days, so that the only abnormality in the urine at the time of labor was a trace of acetone.

Although acidosis was not feared in this case because the carbohydrate tolerance was so high, nevertheless one dram of sodium bicarbonate was administered every two hours. This was discontinued as soon as she became sugar free and the acetone had been reduced to a trace. On October 29th she was delivered of a full-term living child. Two weeks later she was discharged, having gone through a normal puerperium.

When the patient left the hospital, she was given directions regarding her diet and I have learned through the kindness of her physician that she religiously adhered to this and as a result had no further difficulty with her diabetes until April, 1919. During that month she again became pregnant with the reappearance of sugar in the urine. This was estimated to be between 13 and 14 per cent and was accompanied with much acetone and diacetic acid and symptoms of acidosis. The same treatment which had been so successfully used in our clinic in 1914 was instituted. No improvement was noted, so after placing the patient on a starvation diet and after thorough alkalinization, she was curetted under gas-oxygen anethesia and a two months' fetus removed. For the ten days immediately following the emptying of the uterus, her general condition seemed to improve, but suddenly on the eleventh day postpartum she died in diabetic coma.

CASE 6 (Gyn. No. 11093).—Severe diabetes in a multipara, age forty, who entered the department of Obstetrics and Gynecology, January 1, 1920. The family history was entirely negative. In the personal history there are a few things to be noted. In 1916 she had a generalized edema of the body followed by polydypsia, polyphagia, polyuria, nocturia and excessive foul sweating. At this time her physician diagnosed diabetes and placed her on a modified carbohydrate free diet. In 1918 there were more urinary symptoms, namely, burning and smarting urination with intense itching of the vulva.

She was married at the age of seventeen, divorced twenty-two years later and re-

married in June, 1918. She had three children, two living. The first child is twenty-three years old, has never menstruated and weighs 287 pounds. The second is twenty years of age and has Pott's disease. The third was a six months' premature baby, the result of inducing labor for an unknown reason. Her menses have always been normal, the last period coming in May, 1919. Accordingly she should be entering her eighth month of gestation.

On admission to the ward a complete physical and pelvic examination was made. It showed a large-framed, well-nourished woman with normal heart and lungs. The breasts contained colostrum. The fundus of the uterus extended three fingerbreadths' above the umbilicus. The fetal parts and movements could be made out, but the fetal heart could not be heard. The vaginal outlet appeared relaxed, reddened and succulent. The skin of the

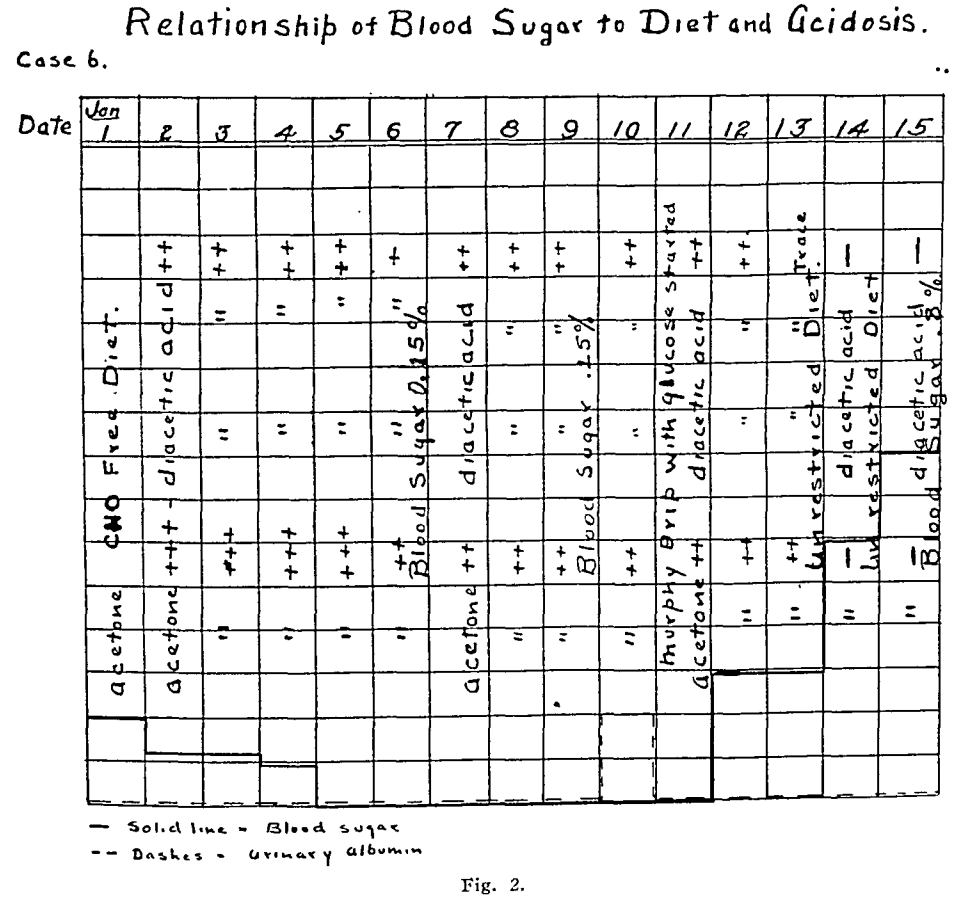

Fig. 2.

toes was markedly thickened and dried and both knee and biceps jerks were present. Her blood pressure at this time was systolic 120, diastolic 70.

A urine examination gave a specific gravity of 1,030, acid reaction with a very high percentage of glucose and acetone but no diacetic acid or albumin. Although she had always dieted moderately, she was immediately placed on a modified green diet which contained 11 grams of carbohydrate, 90 grams of fat and 17 grams of protein giving her 1050 calories a day. On this diet, within four days the sugar disappeared from the urine, leaving, however, very marked reactions for both acetone and diacetic acid. At this time the blood sugar was 0.15 per cent (normal) and, although her laboratory findings indicated a marked improvement, she became very restless and began to vomit. A consultation with the Medical Department gave us the following opinion: "Not a severe diabetic. Present gastric upset not believed to be due to diabetes. Would advise albumin water in spite of vomiting." This advice was adhered to for the next three days. Because the patient could retain nothing by mouth, rec-

tal feedings every two hours were instituted on the 9th. They consisted of 4 drams of sodium bicarbonate, 2 drams glucose, in 10 ounces of water. The urine showed no change, the blood sugar remained within the limits of normal, blood urea 0.0408 grams per 100 c.c., hemoglobin 70 per cent, white blood cells 7,600, blood pressure 128/80. On the tenth day her condition was decidedly worse. There was a rapid pulse with increased frequency of respiration and she expelled most of her rectal feeding. On this day albumin and hyaline and granular casts were found in the urine. Albumin water was again started by mouth and on the 11th nothing but this nourishment was given. It contained 80 grams of carbohydrate in the 22 ounces administered during 24 hours. Her tolerance for sugar evidently was greatly reduced for the urine quickly showed a heavy precipitate with Fehling's. Acetone and diacetic acid were present but the albumin and casts had disappeared. On the 12th food by mouth was retained as a result of receiving 217 grams of carbohydrate. This was followed by a striking improvement in her general condition, for on the following day only a trace of acetone and diacetic acid remained in the urine. On the 14th the urine contained a very large amount of sugar but no acetone or diacetic acid. The blood urea was .036. The fetal heart was heard, was regular and of good quality.

The following day at 7:30 A. M. she went into labor and at 8:40 P. M. delivered a premature, slightly macerated, stillborn fetus by the mechanism of persistent occiput posterior, followed immediately by a prematurely separated placenta. The blood sugars of both mother and fetus at this time had reached the high point of 0.8 per cent. The urine contained a large amount of sugar but no diacetic acid or acetone.

Following the delivery the patient's condition seemed to improve, but during that afternoon she passed into coma and at 8:45 P. M. of the day of labor died with all the symptoms of diabetic coma. The autopsy records kindly furnished in advance of the routine reports for the purpose of this article by Dr. A. S. Warthin of the Department of Pathology confirmed the cause of death mentioned above. The pancreas but more especially the islands of Langerhans (beta cells) showed the typical changes due to diabetes. It is interesting to note that there was an acute nephritis and also a perihepatitis with cloudy swelling of the liver cells.

DIABETES MELLITUS

The mere fact that the presence of sugar was first detected during the course of pregnancy by no means proves that it had not been present previously, but merely indicates that the condition was not accompanied by symptoms severe enough to necessitate the patient consulting a physician. In 66 cases collected by Williams from the literature, he found in 55 instances the disease present before pregnancy. In three of the four cases gathered from the records of the University Hospital the diabetes antedated the period of conception.

By almost all authorities, the complication of pregnancy in diabetes is considered much more serious than the appearance of diabetes in pregnancy. As was shown in the last case reported, that of pregnancy occurring in a severe diabetes of four years' standing, the outcome of both mother and fetus was most disastrous. Again, after reviewing the case preceding the last, where the diabetes although very mild, antedated the pregnancy, the patient, when placed on a proper diet went through a normal pregnancy and puerperium and was delivered of a full-term, living fetus. Five years later, while only two months pregnant, she succumbed to a diabetic coma.

As a rule patients do comparatively well for the first seven or eight months of pregnancy. Occasionally, as was seen in Case 5, they have a normal pregnancy, labor, and puerperium. More commonly and especially in the

severe cases they go into labor and deliver themselves as in Case 6, and those reported by Strouse and Frühinsholz and others, of a macerated fetus or one which dies a few hours after labor, while the mother may apparently improve for a few hours or even days only later to develop coma. Occasionally they rally after such a complication and live a few years only to succumb to tuberculosis or some other intercurrent infection .

There are, however, a few cases of melituria on record, where, without change of diet, pregnancy seemed to benefit this condition. The glucose disappeared from the urine and remained absent throughout pregnancy but reappeared shortly after delivery. This is certainly the exception rather than the rule.

In reviewing the blood sugar determination on the cases reported one is struck by the marked variability. The reports ranged from those within the limits of normal to the enormous figure of 0.8 per cent. In the case of diabetes, syphilis and pregnancy the blood sugar, when the patient was placed on an unrestricted diet, was found to be 0.28 per cent. When the diet was restricted the hyperglycemia immediately dropped to 0.21 per cent and with the advent of antiluetic treatment and following labor a further reduction to within the limits of normal was noted. When the complication of general peritonitis developed the blood sugar rose to 0.402 per cent. The last case, that of a marked diabetic, is interesting because of the fact that throughout the entire pregnancy the blood sugar remained within the upper limits of normal; but as soon as glucose was administered the sugar preceding the onset of the coma reached the high point of 0.8 per cent.

There are many factors which influence blood sugar besides diabetes. Especially do infections and nephritis raise the blood sugar. That of infection is well demonstrated in Case 4, while the damaged kidneys certainly influenced the blood sugar in Case 6. As a rule blood sugar returns to normal under treatment. Rogers believes that a persistently elevated blood sugar is an indication of the severity of the disease or, if it occurs in mild cases, is generally associated with some renal impairment. Efficient treatment, however, can be carried out in most cases by using the urinary sugar as a therapeutic guide.

Acidosis in these cases is indicated by the presence of acetone and diacetic acid in the urine as well as by the symptoms of nausea and vomiting, restless irritability, rapid pulse and Kussmaul breathing and the amount of sodium bicarbonate necessary to bring about the excretion of an alkaline urine. Acetone and usually diacetic acid can be found, whenever there is an appreciable amount of melliturla and frequently, while the patient is on a starvation diet, even after the melituria has disappeared. More commonly acidosis is the result of a diet high in fats, even though the carbohydrates have been reduced to a minimum. Whether the acidosis in the last case reported was due to the von Noorden and later starvation diet or, whether it was the result of the high fat intake is a debatable point. I agree with Joslin, Strouse, Bloor and Tice, that the most important factor in the production of acidosis is fat and secondarily carbohydrates. Hence, in the treatment of these cases the

fats should be reduced to a minimum and entirely eliminated if necessary and the carbohydrates reduced to the point of tolerance.

Nowhere in the literature have I been able to find any consideration of the possibility of the production of a nephritis or exacerbation of a latent nephritis, by the feeding of such a relatively high protein diet, as is indicated in the treatment of diabetes. Newburgh has shown conclusively that in animals an acute nephritis can be brought on by continuously feeding a high protein diet. The same may be true in man. At least it is within the range of possibilities. In pregnant women we know that the most common complication is albuminuria. In practically all cases this is the result of a renal destruction due to one of the toxemias of pregnancy or a true nephritis. It is interesting to note, that in the four cases of diabetes complicating pregnancy gathered from the records of the University Hospital, in all there were signs and symptoms of renal impairment and in the two which came to autopsy reports of some renal pathology. Why then is not diabetes and nephritis during pregnancy ever more of a serious complication than is usually realized? Here we have two diseases which require absolutely different dietary treatment. The one requires a diet low in carbohydrates and fats, while the other should have a minimum of protein. Epstein describes one type of nephritis where there is a high lipemia with a reduction of protein but a percentile predominance of the globulin in the blood. In these he advises the feeding of a high protein diet. As yet the average practitioner has not been able to recognize this type of renal disease and consequently this observation is of little importance to him.

In none of the cases observed in the clinic or in those reported by the various authorities does there seem to be an increase in the morbidity during the puerperium. Although the blood in this complication is supposed to afford an excellent culture medium to organisms, nevertheless, an immunity seems to be conferred to the patient by the acidosis which so commonly accompanies the puerperium.

There is no contraindication in the milder cases, as was shown in Case 5 where a living baby was secured, to the nursing of the child by the mother. It affords a certain amount of diversion for her and in this way offsets the depressed mental state and thereby lessens the demand upon her metabolism.

During pregnancy the patient should be constantly under supervision, and on first consultation should be treated in accordance with one of the methods outlined by Joslin, Allen, Strouse, Beattie or Woldert. These consist either in immediately placing the patient on a starvation diet as advocated by the Allen school, or instead, in using the more conservative gradual reduction of fats, proteins and carbohydrates as advised by the others. In the milder cases, as in Case 5, the omission of fats, bread and sugar will usually free the urine of glucose. Then within a few weeks a tolerance to 125-150 grams of carbohydrate can be secured, after which, provided the urine remains sugar free, protein and fat sufficient to retain the normal weight of the patient can be added. These cases will usually go through an otherwise normal pregnancy and puerperium.

It is the more severe cases, such as Case 6, which ought to be considered in greater detail, since the treatment is more difficult. Here the usual medical treatment combined with surgical interference, if necessary, must be employed. Such interference depends upon the viability of the child and also the response of the disease to medical treatment. In every case the following measures should be observed before any other interference is considered; immediate omission of fats, gradual reduction and final omission of protein, followed by continued reduction of carbohydrates with fasting eventually if necessary. In a gradual reduction such as this, one is much less liable to coma. The urine having become sugar free, the tolerance for carbohydrates is then determined by gradually increasing the latter, until a point is reached just below that at which sugar is excreted in the urine. Next, the proteins are increased until the patient is receiving one gram of protein per kilogram of weight, or less if the carbohydrate tolerance is low. It is advisable to start the proteins before the carbohydrate tolerance has been reached, so that the normal is approached as early as possible. Fat is to be added only after the protein tolerance has been brought up to the required amount and the carbohydrate tolerance has been determined. As long as acidosis and glycosuria are present, the fat must be kept low. In every case one should attempt to feed 30 calories per kilogram of weight.

Other medical treatment of great advantage in combating the acidosis recommended by Sellards is alkalinization by the liberal administration of sodium bicarbonate, either by mouth, rectum or intravenously. Alcohol has been used with great benefit by Allen, Foster and von Noorden to guard against acidosis and also to make up the required calories for sustaining life.

After having employed the treatment outlined above one must act according to the viability or nonviability of the child. Before viability the indications sufficient to terminate the pregnancy in the most conservative manner are (1) an albuminuria, (2) an inability to raise the tolerance so that the patient is receiving 30 calories per kilogram of weight, (3) a persistent hyperglycemia, (4) a persistent acidosis, (5) a history of aggravation of the disease during previous pregnancies. After viability most authorities, chief among whom are Williams, DeLee, Frühinsholz and Lesse, advise waiting, with the employment of medical treatment and inducing labor only when threatening symptoms, such as those mentioned above, plus hydramnion and progressive weakness appear. According to these authorities labor should be brought on by rupturing the membranes, packing the cervix or introducing a balloon or bougie and then permitting the patient to deliver herself. Recently, however, DeLee, Strouse, Joslin, Caldwell and Bibb have, after preparing the patient as for a surgical operation by reducing the hyperglycemia and thorough alkalinization, used Cesarean section to advantage. Of course this method of emptying the uterus should be considered only in those cases where there is a living child in good condition. The section should be performed under gas-oxygen anesthesia and by an experienced operator. The accompanying shock is probably no greater than that of labor and the exhaustion much less. It has the added advantage of affording an opportunity for sterilization of the mother at the time of delivery.

SUMMARY AND CONCLUSIONS

1. A positive reaction with Fehling's solution during pregnancy does not necessarily indicate the existence of diabetes mellitus but is usually due to a lactosuria or alimentary glycosuria and rarely to renal diabetes.

2. Lactosuria is common during both pregnancy and the puerperium. It is entirely physiologic and must be differentiated from the various types of glycosuria.

3. A large number, 30 to 50 per cent, of pregnant women are less tolerant to glucose than nonpregnant individuals. They have no hyperglycemia and are not true diabetics.

4. Glycosuria may be due to a lowering of the renal threshold for sugar. Albuminuria and glycosuria may accompany one another or alternate without hyperglycemia.

5. Diabetes and albuminuria may accompany one another. This complication in pregnancy is an ominous one and calls for the immediate interruption of pregnancy.

6. Diabetes and syphilis may complicate pregnancy. The treatment indicated is both dietary and antiluetic.

7. Pregnancy may occur in diabetic women or diabetes may become manifest during pregnancy. Either is a serious complication. Many patients do perfectly well, but a considerable percentage die in coma or collapse or succumb to some intercurrent infection or die during successive pregnancies.

8. The fetuses of diabetics, leaving out of consideration abortions and premature deliveries, are stillborn or die within a few days following birth in about 50 per cent of the cases.

9. Fat is the most important factor in the production of acidosis. It should be reduced to a minimum or omitted entirely. Its only use is in bringing the caloric requirement of the patient up to normal.

10. If sugar appears to a slight degree in pregnant women it should be carefully watched and controlled by diet and, unless a carbohydrate equilibrium can be maintained, pregnancy should be terminated. The advantages of Cesarean section under gas-oxygen should be kept in mind.

REFERENCES

Allen, F. M.: Glycosuria and Diabetes, Harvard University Press, Cambridge, 1913.
Allen, F. M.: Treatment of Diabetes, Boston Med. and Surg. Jour., 1915, clxxii, 241.
Beattie, Wm. A.: Diabetes in Pregnancy with Report of Cases, Calif. State Jour. Med., 1917, xv, 11.
Bloor, W. R.: Discussion of Doctor Joslin's Article: Boston Med. and Surg. Jour., 1916, clxxv, 156.
Caldwell, H. and Bibb, R. H. L.: Diabetes with Special Reference to Obstetrics, Texas State Jour. Med., 1917-1918, xiii, 274.
Commandeur and Porcher: Recherches sur les sucres urinaires chez la femme enceinte en couches et nourrice, Arch. gén. de méd., 1904, cxciv, 2241.
DeLee, J. B.: The Principles and Practice of Obstetrics, Philadelphia, 1913, W. B. Saunders Co.
Duncan, J. Matthews: On Puerperal Diabetes, Tr. Obst. Soc. Lond., 1882, xxiv, 256.
Epstein, A. A.: Diagnosis of Nephritis, New York State Jour. Med., 1919, xix, 8.
Foster, N. B.: Diabetes Mellitus, Philadelphia and London, 1915, J. B. Lippincott Co.
Frühinsholz, A.: Diabète et gestation, Ann. de gynéc. et d'obst., 1913, s.2., x, 477.

Joslin, E. P.: Pregnancy and Diabetes, Boston Med. and Surg. Jour., 1915, clxxviii, 841.
Joslin, E. P.: Results Obtained in Treatment of Diabetes Mellitus, Boston Med. and Surg. Jour., 1916, clxxv, 147.
Joslin, E. P.: Treatment of Diabetes, Philadelphia, 1916, Lea & Febiger.
Lesse, W.: Ueber Diabetes bei Frauen, Monatschr. f. Geburtsh. u. Gynaek., 1902, xv, 680.
Mann: Die Schwangerschaftsglycosurie, eine Form des renalen Diabetes, Ztschr. f. klin. Med., 1913, lxxviii, 488.
McDonald: Glycosuria in Obstetrical Practice, Urol. and Cut. Rev., 1913, xvii, 18.
Norris: Quoted by Schiller: Surg., Gynec. and Obst., 1919, xxix, 450.
Novak, Porges and Strisower: Ueber eine besondere Form von Glycosurie in der Graviditaet, Ztschr. f. klin. Med., 1913, lxxviii, 413.
Newburgh: Private communication.
Offergeld: Zuckerkrankheit und Schwangerschaft in ihren Wechselbeziehungen, Arch. f. Gynäk., 1908, lxxxvi, 160.
Reinhardt, E.: Zur Frage des Diabetes und Schwangerschaft, Ztschr. f. Geburtsh. u. Gynäk., 1918, lxxxi, 87.
Rogers, O. F.: Observations on Blood Sugar in Diabetes Mellitus, Boston Med. and Surg. Jour., 1916, clxxv, 152.
Schiller, H.: Estimate of Fats, Cholesterol and Sugar in the Blood of Thirty Pregnant Women, Surg., Gynec. and Obst., 1919, xxix, 450.
Sellards, A. W.: Principles of Acidosis and Clinical Methods for Its Study, 1919, Harvard University Press.
Slemons, T.: Nutrition of the Fetus, Am. Jour. Obst., 1919, lxxx, 194.
Strouse, S.: Diabetes and Pregnancy. Treatment of Acidosis, Med. Clinics, Chicago, 1916-1917, ii, 47.
Tice: Discussion of Doctor Strouse's Article on Diabetes Mellitus and Acidosis, Med. Clinics, Chicago, 1916-1917, ii.
Wilcox, R. W.: Treatment of Diabetes and Pregnancy, Monthly Cycl. and Med. Bull., 1913, vi, 385.
Williams, J. W.: The Clinical Significance of Glycosuria in Pregnant Women, Am. Jour. Med. Sc., 1909, cxxxvii, 1.
Williams, J. W.: Obstetrics, New York and London, 1915.
Woldert: Allen-Joslin Treatment of Diabetes Mellitus, New York Med. Jour., 1918, cviii, 764.

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TOXIC VOMITING OF EARLY PREGNANCY*

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CLINICAL observations on the early vomiting of pregnancy led me in 1917, to begin an investigation, which has proved of negative value only. I will, however, take the liberty of reporting the results in the first part of my paper and will then pass on to observations of greater practical value, from the standpoint of treatment.

These observations were: that in many instances a husband could not be used as a donor for his wife in blood transfusion and, that in many instances, a woman will have severe nausea and vomiting in successive pregnancies with one husband and little or no nausea and vomiting in pregnancies with another husband. This marked difference in pregnancy with different husbands, in the face of a problem about which we have as yet much to learn, seemed worthy of attention, notwithstanding the fact that pregnancies with the same husband frequently differ in point of presence or absence of nausea and vomiting.

Knowing as we do that the cells of the offspring are the composite of cell characteristics derived from paternal and maternal elements, it seemed a fair hypothesis that the marked differences shown in the reactions of the mother might be due to the differences in the toxicity of substances elaborated by the ovular or embryonal composite as the result of impregnation from different parental stocks. Coincident with these observations I found so many incompatible blood groupings between husband and wife in cases of severe vomiting that I thought some parallel might exist. It seemed worth while to investigate the matter, because from the standpoint of treatment such investigations might provide guides in cases where therapeutic abortion was under consideration and might lead to improved serum or antianaphylactic therapy accordingly as the condition was found to depend on a definite toxin and the final establishment of an active immunity or a state of sensitization resulting in anaphylactic phenomena.

The investigation has shown that no parallel exists between compatibility and incompatibility of blood groupings of the husband and wife and the absence or presence of severe nausea and vomiting. For every case found of severe nausea and vomiting where the husband's blood grouping was incompatible with that of the wife, could be found a case with little or no nausea or vomiting. On the theory of immunization this would not be conclusive, however, but lately one case terminated in death in which both the wife and husband were Group IV and his blood was used for transfusion, without the slightest reaction, before instituting therapeutic abortion. This seemed to show that the grouping of the husband and wife can be of no aid in determining the absolute necessity of therapeutic abortion.

*Read at a meeting of the Clinical Club of Minneapolis, May 6, 1920.

Knowing, from the work on infant grouping by Dr. Rood Taylor of this city, and others, that it is impossible to predict the grouping of an infant from the grouping of either the father or the mother, I thought it might be possible that, though definite grouping develops only after birth, we might predicate a predetermination of grouping, as in regard to sex, and we might find that the presence of nausea and vomiting bears some relation to the grouping of the child, if not to that of the father. In the few cases that I have been able to follow, I have found that no such relation exists. Pernicious vomiting was present in pregnancies where the final grouping of the offspring after birth was either compatible or incompatible with that of the mother. One case now under observation is important as disproving any relationship between grouping and vomiting from all angles. This woman has just recovered from a severe attack of toxic vomiting in which a therapeutic abortion was under advisement. Both she and her husband are in Group IV. In two former pregnancies with the same husband vomiting was so severe that therapeutic abortion was under advisement. The children of these former pregnancies are both in Group IV.

Let us now pass on to observations that have led to the accentuation of treatment that to me has proved of marked value.

The nature of the toxin or antigen, the cells from which it is derived and whether the resultant symptoms are purely the toxic result of the antigen on important organs or the result of sensitization and anaphylaxis in addition, are moot questions. Whatever the nature and *modus operandi* of the toxin, it is fair to assume that any abnormality that may increase absorption, decrease elimination and increase the general sensibility of the nervous system in a condition where prominent symptoms point to a reaction of nerve centers leading to a vicious cycle of starvation phenomena, may turn the balance against the patient. It is my belief that this is the reason why local measures, psychotherapy and all aids to general good health and a normal nervous system, have at times cured the condition in a striking manner and out of all seeming proportion to the actual changes that each particular measure could accomplish. Reflex and neurotic factors should not blur the evidence of the probable real cause, a toxin.

The subject has been attacked from the standpoint of immunity and sensitization, with reported success. It has been stated on excellent authority that good results have been obtained by treatment with the blood of women who have just recovered from the toxemia. I have had no experience with this method. At present it presents certain practical difficulties obvious to all. The successful use of corpus luteum, as advocated by B. C. Hirst, has been verified by many authorities. Reported failures and personal failures may be due to incorrect administration or to inert substance. It is a development that should receive our attention. I do not intend giving a résumé of all theories with the rationale of treatment used in this condition. I have mentioned the above types because they throw light on two fields of investigation that to my mind offer the greatest hope of future advance in this toxemia of pregnancy, namely, immunity and anaphylaxis. At present in the light of

all clinical and comparative experimental data these fields are still obscure in their relation to this subject.

I wish to point out a certain parallel between anaphylaxis in animal experimentation and the early vomiting of pregnancy and a parallel of treatment. Though this parallel may be fortuitous, I have found the treatment to offer the greatest chances of success in pernicious vomiting short of therapeutic abortion. In both conditions we have a heightened nervous sensibility with a storm of nerve centers. In both conditions we may have all four of the following symptoms; nausea, vomiting, salivation and acute abdominal pain. If an animal be sensitized to a foreign substance and then held under the influence of a drug such as ether, alcohol, chloral hydrate, etc., (not morphine or its derivatives) that reduces the nervous sensibility, during the period of the action of the drug a lethal dose of the substance will produce no anaphylactic phenomena and the animal will recover from the influence of the drug unharmed. Of all types of treatment short of therapeutic abortion in pernicious vomiting it has been my experience that a parallel reduction of nervous sensibility by bromides and chloral hydrate has led to the most frequent success. Such treatment has been used by the profession for many years. The most frequent cause of failure is that the drugs are not given in sufficiently large doses. If we can stop the vomiting for twenty-four hours, judicious resumption of feeding by mouth usually meets with success and recovery obtains where patients are brought in apparently *in extremis* and where it has been thought that therapeutic abortion was imperatively indicated. I bring out this parallel between the treatment of sensitized states and the treatment of pernicious vomiting because in a condition where no unanimity in the theory of origin exists it may prove of value in future experiments and because the practical application of the treatment in pernicious vomiting does prove of marked value. At present I can only explain the beneficial results of lowering nervous sensibility by the cessation of the exhaustion previously caused by the constant vomiting and loss of sleep and by the elimination of starvation phenomena. It is a clinical fact that even after vomiting ceases, the patient may die apparently from the action of the toxin on vital organs. What I wish to emphasize is that success often follows previous failure in the sedative treatment when heroic dosage is used and when certain finesse in administration is practiced. To be explicit, I will outline the routine line of procedure in such a case.

By history and physical examination establish the diagnosis.

Correct any malposition of the uterus and treat judiciously any manifest pathology in the pelvis.

Establish treatment of mouth infections and see to it that the teeth are kept clean. Use any pungent tooth paste that leaves a clean taste in the mouth of that particular patient.

Put the patient to bed in a quiet, well-ventilated room, prohibiting the visits of relatives or acquaintances. A hospital where strict regulation can be obtained is better than the home. Put in attendance a capable nurse.

Cease all administration of fluid and food by mouth.

Give a soap suds enema every four hours in the first twenty-four if the

patient is awake and after each result place in the rectum six ounces of equal parts of a 10 per cent glucose and 5 per cent soda bicarbonate solution containing sixty grains of sodium bromide. Be sure to induce sleep at night by the addition of from fifteen to thirty grains of chloral hydrate to the 8 P.M. administration and repeat this every four hours until sleep is secured. Be sure to give the enema and get a result before giving the medication. This not only clears from the bowel any decomposition products, but overcomes the extreme antiperistalsis that is present in many of these cases. The patient is manifestly more comfortable and will retain the drug better.

If severe dehydration is present, water should be given between drug administrations by proctoclysis.

Begin administration of food by mouth twenty-four hours after vomiting has ceased. Begin with a dry diet, low in fat and protein and high in carbohydrates, laying great stress on any preference of the individual patient. Water or water mixed with fruit juices if latter is more palatable may be allowed between meals.

The day after the cessation of vomiting reduce the administration of enemas and bromides to two, in the morning and afternoon.

If all goes well, on the next day give only the evening dose, then on each successive day reduce the amount in the evening administration by half. Be sure that the patient sleeps at night. I have found the evening administration to be the most important. The effects of the drugs have not worn off by morning when the nausea and vomiting are so apt to recur.

Do not allow the patient to raise her head from the pillow until a marked improvement is observed, and do not allow her to get up until her general condition has returned nearly to normal. Urinary findings, pulse and weight are good guides. If the pulse remains rapid, go slow. It is sometimes necessary to keep the patient in bed for weeks until immunity or the selective and protective action of the developed placenta or desensitizing internal secretions bring the process to a close. Experience shows that whatever the cause, it has a tendency to limitation about the fourth month.

This treatment can be modified according to the severity of the case. However, be sure that the initial doses of the sedative are sufficient to stop the nausea and vomiting as quickly as possible. In most cases the nausea and vomiting cease after the first dose. It is very important, I believe, that the nervous sensibility be tremendously reduced at once.

Watch the urine for sugar. A marked reaction calls for the diminution or removal of glucose.

If the vomiting continues or the vomiting ceases and the pulse continually rises to 110 or over, or the marked traces of acetone and diacetic acid appear in the urine, the gravity of the situation increases. Blood chemistry studies do not as yet clearly direct the course. Metabolism studies may in the future. Clinical experience and acumen together with general laboratory data are still our last guides as to the imperative need of therapeutic abortion.

Lately I have seen one case and heard of two others where after consultation had justified a therapeutic abortion, a simple cervical dilatation was performed with immediate improvement of the condition, and rapid re-

covery without abortion. This may have been a matter of chance, but other cases have been reported and it may be worthy of trial as a last resort before therapeutic abortion. Such a procedure should be subject to the same laws of consultation as therapeutic abortion.

When after consultation therapeutic abortion is definitely determined upon, I believe it is best to empty the uterus at one sitting by vaginal hysterotomy if necessary.

910 DONALDSON BUILDING.

THE UNMARRIED MOTHER BEFORE AND AFTER CONFINEMENT*

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THE PROBLEM of illegitimacy is so large and many sided that we may as well admit in the beginning that all agencies other than the state or central government are in a measure inadequate for its solution. Scandinavian countries and France recognize the truth of this: each attempts a state solution according to its temperament and point of view. In Scandinavian countries, paternity established, the child is essentially legitimized and its father must support it until it can earn a living. In France if a child is illegitimate, it is not even legal to declare its father without his permission, but the State, if necessary or wise, becomes its adopted father and undertakes to rear it in the country without want and under state (official) supervision. Moreover, a trade is taught, and it is regarded as the legitimate child of its foster parents. We have not the frank viewpoint either of the one—that a man's responsibility for his children includes, under all circumstances, his illegitimate as well as legitimate children; or of the other—that the State must protect the blood integrity of each family to the extent of itself assuming the fatherhood of illegitimate children. It is interesting to note how each system reflects the country in many ways, but most strikingly in relation to woman's position in that country, for Scandinavia gave birth to the "new woman," while France is still a stronghold of the "old woman." Each recognizes frankly that illegitimacy exists as a State proposition and would feel that our attitude—on the whole that it is an occasional accident fit for private charity and not of state importance—is a hypocritical one. However, we have not the continental point of view or the Scandinavin either, neither is it proved that we should have, nor would their methods work with us. Nonetheless, our solution worked out in accordance with our temperament lies probably with the State, at least in part—certainly it lies in the future, though illegitimacy has been studied here for many years.

I have just referred to the bigness of the problem and I would impress this further with a few figures from Massachusetts. In a few years prior to the war, from four to five per cent of all registered births in Boston were illegitimate, in round numbers 850 births per year. In the same year, 2.5 per cent of births registered in Massachusetts were registered as illegitimate,

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over 2,000 births per year. These figures are, of course, smaller than the truth. In a twenty-year generation then. we have born in this State—and these figures show it is a state-wide problem, not a local one, especially as many of the Boston births are of outside Boston residence—between forty and fifty thousand illegitimate children at the least, with the probability that a correct figure is sixty or sixty-five thousand.

These children are economically worth to the State one hundred million dollars plus, if they become good citizens; if they become bad ones, besides the loss of the one hundred million they become a state expense along the routes of insanity, criminality, prostitution, etc., to an incalculable amount. It is fair to assume that the neglected child born out of wedlock has less incentive to go right than any other class. It is obvious that prostitution, criminality, and venereal disease are recruited from neglected women who have had illegitimate children. The infant mortality rate for 1914 for children born in wedlock was 95. The infant mortality rate in 1914 for children born out of wedlock was 281, three times as great. This means that between one-quarter and one-third of the infants born out of wedlock die before they reach one year of age. This represents so much economic waste. The chief cause of this high infant mortality rate is separation of baby and mother.

The number of deaths under one month, per thousand illegitimate births, was two times as high as legitimate births; at one month it was eight times as high; at two months six times as high. Another difference was very noticeable: the death rate from gastrointestinal disease was six times as great in illegitimate as legitimate babies. These figures show the seriousness of the state-wide problem of illegitimacy.

The first step in progress in the solution of the problem of illegitimacy in America depends on a reconciliation of two opposite or at least differing points of view. For lack of better terms these may be called the "Orthodox" and the "Social Service" points of view. It is not worth the space to trace the growth of these in the fields of illegitimacy, but it is apparent to any outsider touching the work that they exist, that they conflict, and that because they conflict they hinder progress. It is equally apparent that the "Orthodox" point of view sees illegitimacy in terms of *Sin* and that the "Social Service" point of view sees illegitimacy in terms of *Problem*. To the ordinary person of today, there is little to choose between listening to an exhortation before a gathering of illegitimately pregnant women on original sin and eternal damnation, and reading the wordy "patter" of some professional social service investigator on the "key-concept" to be unearthed in studying case records. Both seem equidistant from tangible results and on the whole their past records show this. The "Orthodox" point of view wishes soul salvation; the "Social Service" point of view seeks economic salvation—and the one is apt to criticize the other's work for putting stress on its own feeling in the matter. This hinders progress. They should realize that they are working for the same end and "get together."

It is hard for me to see that either is entirely right—saving a woman's soul may make her economically efficient, or at least willing to become economically efficient, or it may not; making a woman economically efficient may

make a woman save her soul, or willing to save her soul, or it may not; but, and I believe that this is the crux of the situation, before you can save her soul or make her economically efficient or both, you must discharge her after the birth of her baby only after such care and after such time that she may be self-supporting at work.

We may epitomize this one big outstanding fact by saying that, while it may be of no economic importance if a woman with a husband to support her and her child is left in poor shape after childbirth, it is the *sine qua non* for her economic salvation that the mother with no husband to support her and her child must be discharged in the most perfect health she has ever enjoyed. That she shall have faith and religion either restored or inculcated, if possible, is highly desirable, that she be helped economically and studied as a problem is also highly desirable—and I do not see that these necessarily conflict—but that she enjoys perfect health to work is essential.

We next consider how to attain this result under present conditions and with present existing facilities without taking the long and difficult step to complete State control.

We may pass by the use of boarding out in the carefully investigated family, except for the individual exceptional case; for, because of its diffuseness, this system obviously cannot attain the desired result. This fact becomes clearer when we see how much time must be used to attain it; and overlooking the occasional case where the girl's family wish to keep her at home and shelter and provide for her, we find Maternity Homes. By keeping these at a high level of staff—superintendent, teachers, doctors and nurses, and social service—we may obtain satisfactory results.

Let us consider the arguments in favor of the use of the present homes: (1) The practical reason that they exist and would be difficult to get rid of, especially as they believe firmly in themselves and represent a large monetary investment; (2) that only in small institutions is it possible to get home atmosphere and personal contact with the home mother and her assistants; (3) that they are relatively efficient. (a) Of the 847 infants of illegitimate parents in Boston 49 per cent were born in hospitals, 25 per cent in maternity homes, 3 per cent in the public infirmaries, 23 per cent in private homes. Agency or death records show that 230 of 847, 27 per cent, had died before they were a year old. Of the infants born in private homes 24 per cent were known to have died; of those born in hospitals, 35 per cent; *of those born in maternity homes and the public infirmary, only* 17 *per cent.* (b) In the maternity home with which I am connected 425 consecutive mothers, from 1914 to date, have been confined without a maternal death. In this time twenty-five babies died, a rate under 6 per cent. Of these ten were premature. Only one case in six years died of gastrointestinal disease. The average post partum stay in the institution was ten weeks, so that while this death rate is not directly comparable, it does cover the first two or three months after birth.

The advantage of such maternity home care over that in the selected private home is that the woman and baby get two, three, or four months' good prenatal care, the best possible hospital care in labor, and the best postpartum

care, so that the mother is sent out—and this is fact, not theory, because she can go only on the physician's estimate that she is fit to work—in such state of health that she can support her child, and this is what her salvation and economic worth depends upon. In order to accomplish this properly, the following factors are needed: first, trained obstetricians and hospital facilities, for we have handled contracted pelvis, adherent placenta, toxemia of pregnancy with and without convulsions, hemorrhagic disease of the newborn, etc.; and in this series we have made our own necessary repair work, cleaned up tubes, and done other necessary pelvic and general surgery; it takes a trained pediatrician for the babies; it takes a dental staff, an internist, a surgeon, an eye, nose and throat specialist and a neurologist, as available consultants. It is hard to see how this can be reproduced for illegitimates except in a maternity home.

I have outlined this in some detail to show not only the high degree of efficiency it is possible to obtain, at least medico-sociologically, in the existing agencies, but to back my contention that unless the maternity homes can and will show a good record of accomplishment, they should cease to receive support, because a staff of high grade can be obtained for all of them. These results were obtained in a home originally and still fundamentally of the orthodox type but in which there is hearty accord between the trustees, superintendent, and the medical staff, and in which each group tends strictly to its own business, and in its own department is supreme; in a home inadequate to care for the various illegitimates it should care for, and to give its patients the exercise in the fresh air they should have as it is in a crowded, poor part of the city. Incidentally the staff is sufficiently large so that each man gives but little time in a year to the work and every man of the staff holds one or more, so to speak, major staff positions in bigger hospitals.

In an ideal home we should get better results with gardens and outdoor porches, and better facilities for handling babies, with a distinct house for caring for venereal pregnant illegitimates and a syphilologist added to the staff; with a bit more breadth of social service and a greater individualization and mental study of each case by the neurologist working with the social service, with a view to placing it most favorably; with a wider publicity, and a carefully individualized study of the adoption question; with rooms to take back mothers and babies after discharge—for illness or rest, or during temporary unemployment while placing in better or different work, so that each mother would return to us in trouble as to her real home—we should obtain results satisfactory for the country if such places were run in each community where needed. Further we must evolve some system of grading and typing illegitimates before we start work with them, so that we do not fritter away the high cost on useless material and contaminate the hopeful individuals with the hopeless.

The sanest solution to this end is to establish a State Clearing House or State Board for Illegitimacy.

This raises the question why, if maternity homes may be made to give good results, should there be a State Clearing House for Illegitimacy? Chiefly because there is little intelligence or rather little knowledge, and that not

coordinated, on which to base intelligence, shown in the distribution of types of illegitimacy. The different agencies each have an idea of the type it works best with. A clearing house for distribution purposes would give them that type, but chiefly a clearing house would sort out the mentally deficient. The mentally deficient illegitimate gets in everywhere. She is said to comprise from 40 per cent to 60 per cent of all illegitimates. She is a menace and a useless expense because good care for high grade illegitimates is very expensive. She should be sorted out and put where she has no opportunity to repeat. This a clearing house with a primary mental examination would do, and certain existing agencies could handle these cases. Also, take the question of venereal diseased illegitimates. These represent 8 per cent or more of Boston's illegitimates. Venereal disease is an accident accompanying illegitimacy. There is no valid reason for making it a distinction against good care, rather the reverse. Yet as matters now stand, the woman unlucky enough to be infected must go to a less desirable place than one who is merely illegitimately pregnant. The clearing house would care for them through some designated, existing agency. There are certain types, as the very young and the very wilful, who are better cared for in private homes than in maternity homes, both for themselves and for the institutions. These the clearing house would provide for through agencies already existing which are familiar with this type of case, as Children's Aid Societies.

This clearing house must of necessity be composed of representatives of each agency in so far as the placing of the case goes in the beginning, except that certain types like the feeble-minded and venereal cases will go directly to designated agencies. Only by this method will you prevent the jealousies of different participating institutions. Placed from this clearing house, the report on each case, followed for one year if possible with the end result, must come back from each agency for compilation and study. In five or ten years these accumulated data will have sorted the women into different types and will show what types are best handled in each way. In this way only can progress be made in the study of this great economic problem, and only in this way can we study prophylaxis of illegitimacy.

CONCLUSIONS

1. That illegitimacy is a state problem.

2. That at present little or no progress is being made with the problem in this country.

3. That the best form of care for high-grade illegitimates requiring care outside their own homes—with a few exceptions—under present conditions, is the well-equipped, well-staffed maternity home.

4. That the worst form of care under present conditions for illegitimates —with a few exceptions—is a public lying-in hospital or maternity wards in public or semipublic general hospitals, because they are usually taken in only in labor and discharged too early.

5. That the best form of care for low-grade illegitimates—with a few exceptions—under present conditions are the state institutions.

6. That the medical and social service standing of the maternity homes be kept to as high a degree of efficiency as possible under State Board of Illegitimacy supervision.

7. That the chief reasons for lack of progress are inadequate facilities for sorting, distributing and recording end results, and for coordinating effort, expense and machinery.

8. That such machinery may be obtained from a central clearing house composed of a representative of each agency, under the directorship of a long-time chairman, with the necessary physicians, social workers, and clerks.

9. That the cost of such a board should be supplied by the agencies interested, including the Commonwealth.

10. That in addition to the fact that a clearing center would reserve only the worth-while-working-over woman for the more expensively run agencies, it would be of equal or greater use economically in early segregation, and early observation of a large number of mentally deficient whose first tangible evidence of their mental condition is pregnancy.

11. That the problem of illegitimacy is big enough to be handled and should be handled as an entity—directed legally, sociologically and medically—loosely at first until knowledge is accumulated—under one office; that any legislation, as for example, a proposed Maternity Pension Bill, should not include clauses concerning illegitimacy because it will increase the present too great decentralization and so add to the present confusion.

19 Bay State Road.

THE PROBLEM OF THE EXPECTANT MOTHER IN RURAL COMMUNITIES*

By Lottie G. Bigler, M.D., Armour, South Dakota

A PHYSICIAN from the city starting out in a village and country, encounters many problems and difficulties. I well remember my first year in rural practice. Many times, I have been discouraged and felt helpless, for there is absolutely no cooperation among physicians in rural communities.

I will try to tell you of some of my experiences and describe to you some of the problems of expectant mothers in the community in which I practice and will give you some possible solutions of these problems.

The average rural home is a disgrace to civilization. It is usually small—very inadequate to properly house the large family which we usually find. There is improper sewage disposal, poor water, probably contaminated by sewage. Often the sewage from the barn or privy seeps into the well. These are often located so that there is direct drainage into the well or cistern.

I know a family of fifteen children who live in a two-room house. All of these children were born in this house and the only care this mother ever had was what her husband and older children gave her. They were so isolated that even the neighborhood midwife did not get there. During the mother's last pregnancy, as she did not feel as well as usual, she consulted me. I found albuminuria present. I warned her and tried to instruct her. I thought, probably, I had made no impression on her but she became so worried about herself that she sent her husband to engage me for her confinement. He was rather disgruntled about her new-fangled notion of wanting a doctor. His mother had never had one and she had had fourteen children. His wife was a strong woman, did all her own work, and even helped him in the field. But he was good to his wife and would not be stingy with her and would give her her own way this time. The baby arrived in due time and I was not called. When I questioned them in this regard, the husband said it was just too far to call a doctor out and the roads were bad and besides, they didn't need any help.

Note. Although, in a sense, Dr. Bigler's article cannot be termed technical, the editor desires to present it to the readers of this Journal for several reasons. It is a frank record of personal experiences that, although generally accepted, are not sufficiently appreciated,—a record that unfortunately discloses the low plane of obstetrics among what may be regarded as an ignorant but nevertheless large and important part of our population. This lack of interest and appreciation by the rural community of proper obstetric care is correspondingly reflected in the profession. An improved point of view in one class must go hand in hand with that of the other. The importance of parturition and its consequences must be impressed upon the lay, as well as the professional, mind and this can only be accomplished by instruction; by extending the facilities for safe delivery, including town and county hospitals, visiting nurses or trained attendants, and above all, by cooperation between the rural practitioner and his, perhaps, more fortunately situated, urban colleague. The mortality and morbidity of childbearing still remains alarmingly high, but the facts are now becoming impressed on the national conscience. The need for better obstetrics is evident from the paper of Dr. Bigler and of others. To overcome the unfortunate state of affairs referred to, publicity above all things is essential, not as manifested by temporary hysterical agitation, but by a plain statement of facts. That such publicity will bear fruit is the firm belief of the Editor and will influence him in presenting papers of this and of similar character in the pages of the American Journal of Obstetrics and Gynecology as opportunity offers.

*Read at a meeting of the American Child Hygiene Association held at St. Louis, October 11-13, 1920.

With each pregnancy, these women work harder, for there is one more to care for and possibly more hired men to cook for, with no provision for hired help in the house. The food is not always what a woman needs. Her diet consists largely of pork and potatoes. The butter, cream, and eggs are sold to buy more quarter sections of land. There is no lack of funds among the farmers in the rural districts in which I am acquainted. What these people need is education so that they may see the necessity in diverting some of their funds to care for the mother of our next generation and thereby, give the unborn a better chance in life.

According to statistics taken from the rural communities of six different states, eighty per cent of the pregnant women have received no advice or instruction during pregnancy. This percentage is even higher in some localities. At least half of the women do not engage a doctor before the last month. Many that do, merely announce the fact to the doctor either over the telephone or by letter. I do not think the laity are entirely to blame, for many women have told me they had asked their doctor if a urinalysis ought not to be made and the doctor had said it wasn't necessary. We general practitioners need to be stirred up, for I believe we are all guilty of laxness. If we would seize every opportunity, a great deal might be done toward educating our patients. A case of mine illustrates the ignorance of some of these people. I was called out in the country fourteen miles, over almost impassable roads, to see a German woman. The husband had driven several miles to telephone, as they had no telephone themselves. He reported that she was not very sick—that she only had a little rheumatism in her back. I found her all alone in the two-room shack. All but one of the windows were boarded up to keep out the winter cold and incidentally all the fresh air. Two fires were going full blast and the temperature of the room was at least 90 degrees. The woman was lying on the bed. I immediately sized it up as a case of nephritis with threatened eclampsia. Before I left, the husband returned and I explained his wife's condition to him. He seemed very much surprised to think that this had to happen to his wife, and he liked even less the expense of having a nurse and a housekeeper.

Isolated families, some of which are seventy-five miles from a doctor are the ones who present the greatest problems. Many of them depend on ignorant midwives for their care and instruction. Often the woman dies before they get a doctor there. Many of these farmers are foreigners. They need help badly and are the hardest to reach, for they look with suspicion on any innovations. The mothers often work in the field up to the last minute, performing most arduous tasks. It seems to me that the expectant mother in the barnyard gets far more attention and better care than the one in the house. If she gets sick the whole household is upset, especially if she be a pedigreed animal. The farmer sends for miles to get the best veterinarian. The State provides free courses on how to keep the animals healthy and how to produce the strongest offspring. I am reminded of a man who came to engage me to attend his wife who was near term. He said she hadn't been

well for the whole nine months. I asked him why he hadn't consulted a doctor about her. He said he didn't think there was any need. He supposed they had to feel badly the nine months, she always had during her other pregnancies. In the course of the conversation, he asked me how much I charged. I told him my fee. He said that was ten dollars more than he paid three years before. I informed him that all fees had been raised. He said he believed he could get it done at the same price he paid before. He said "I would like to have you. You have been recommended so highly, but you can't blame me for saving ten dollars if I can." I said, "No, I can't blame you if you have no choice of doctors, perhaps it will be all the same to you to get the cheapest." He said if he couldn't get it done cheaper, he would be back and engage me. I heard afterwards that he dickered with an old retired doctor and finally got him to agree to come for the fee he paid three years ago. I wanted to suggest to him to advertise for bids, lowest bid gets it regardless of qualifications. This man owns a half section of land worth $150.00 per acre, and his crop this year is worth about six thousand dollars.

Another example: The husband came in to engage me for his wife's confinement. When I questioned him, I found out his wife was not at all well. I suspected nephritis and advised him to bring her in for an examination or at least have a urinalysis made. I never heard from them until about the end of term and got an urgent call. I found her in convulsions and delivered the baby. The mother died soon after delivery and it was with difficulty the baby was saved. The husband couldn't be made to see the need of these new ideas. He thought it was the doctor's modern method of profiteering. He also remarked he was sorry to lose his wife as she was a good cook and could milk more cows than he could.

I wish the mothers could be instructed on making layettes. Many times the infant arrives with very little, if any, provision made for clothing. They argue that if it lives, they can get things at the store. So many seem to expect the babies to die at birth or to be stillborn. The percentage of deaths is high and I think it is due largely to the fact they expect it so and do not do the things necessary to prevent infant mortality. I find that among those who do provide clothing of sufficient quantity, the materials are not right. I have seen one outfit after another without a thread of wool in any of the garments. I maintain wool is very necessary in a layette.

No small part of the problem in rural communities is that of the unmarried expectant mother. Sometimes it seems that illegitimacy is on the increase. During my first six months in the community where I am practicing, eight girls came to me pregnant from two to eight months. I suppose more come to me than to the other physicians because women in the profession are scarce in this State. They probably think a woman will be more apt to help them out of their difficulty. I have succeeded in talking many of these girls into choosing the honorable path. If only more could be reached, many tragedies might be averted.

No doubt, these problems of expectant mothers in rural communities have to be approached in different ways, in different communities. The crying need is for nurses trained for rural work. The average nurse born and

raised in the city, is unable to adapt herself to rural conditions. One nurse for a county is insufficient. There should be enough nurses so that all homes could be visited and individual instruction given. Health centers and free clinics should be organized with the school house as a meeting place. Sterile supplies could be provided at cost. The school teacher could give some instruction if she were capable. We must have public health inspection in the rural homes. Here often by chance, we discover contagious diseases raging with no effort made at isolation of the sick and in most cases, it is not even reported. By special legislation, we might accomplish much. The Sheppard-Towner bill may help solve these problems effectively. At least, it would do much to protect the prospective mother and her infant. We must face these problems squarely and do all in our power to give the expectant mother and the unborn infant the best possible chance.

Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY. FORTY-FIFTH ANNUAL MEETING HELD IN CHICAGO, ILL., MAY 24, 25 and 26, 1920

(*Continued from November Number*)

DR. RICHARD R. SMITH, of Grand Rapids, Mich., read a paper entitled **Hemorrhages into the Pelvic Cavity Other than Those of Ectopic Pregnancy.** (For original article see page 240.)

DR. JENNINGS C. LITZENBERG, Minneapolis, Minn., presented an extended lantern demonstration illustrating the subject of **Microscopic Study of Ruptured and Unruptured Tubal Pregnancy.** (For original article see page 223.)

DISCUSSION

DR. J. WHITRIDGE WILLIAMS, BALTIMORE.—The only personal experience which I have had with conditions referred to by Dr. Smith, has been in two cases of intraperitoneal hemorrhage due to bleeding from fresh corpora lutea. Both patients were operated upon. In one the ovary was removed, while in the other the bleeding corpus luteum was excised. Concerning the other matters which Dr. Smith has mentioned, I have had no personal experience, except in the case of ovarian hematomata. Concerning their origin I know nothing and I regard it as one of the problems which is in urgent need of study and revision.

The method of study chosen by Dr. Litzenberg is highly desirable and one which affords us very accurate and important information. For years I have done the same thing and a great part of my knowledge concerning the histology of extrauterine pregnancy has been gained in that way. It is a pity that many of his specimens were not more highly magnified, for owing to the lack of detail it was sometimes difficult to judge the correctness of his description. In general, his specimens illustrate conditions with which we are familiar and which show well what happens.

The great difference between uterine and tubal pregnancy lies, as he has quite correctly said, in the abundant decidual formation in the uterus and its scanty formation in the tube. As you know the uterine decidua forms a thick and continuous membrane, but in the tube we never see such a structure, and the most we observe is the presence of a few isolated decidual cells. I agree with him when he says that in general the further we get away from the site of the tubal pregnancy the more abundant the decidual cells become; for in every instance in which I have seen a marked tubal decidua it has been in the nonpregnant tube.

My students are taught that the function of the decidua is three fold; first, to afford a nidus for the implantation of the ovum; second, to afford a medium of nutrition for the ovum until the placental circulation has become established, and third, and quite as important as the other two, to prevent the invasion of the uterine wall by the fetal tissues. Indeed, in the rare cases of spontaneous rupture of the uterus occurring in the early months of pregnancy, we practically always find the condition associated with imperfect decidual development.

I take it therefore that one of the very important functions of the uterine decidua is to prevent erosion of the maternal tissues. In the tube we do not get a well marked decidual reaction and consequently the outcome of tubal pregnancy differs markedly

from uterine. In both uterus and tube, we believe that the egg is implanted in the same way and, passing through the epithelium, burrows into the tissues beneath it. In either event it dissolves away the cells immediately in contact by its trophic action. In the uterus it sinks down into decidual tissue, but in the tube it passes directly down into the muscle and connective tissue and this makes a wonderful difference. In both uterus and tube we find the periphery of the egg surrounded by a zone of degenerate tissue, the so-called canalized fibrin. In the uterus this remains sharply marked off from the decidua, whereas in the tube the fetal tissue comes in direct contact with the maternal and produces a widespread destruction, the chorionic trophoblast invading the tube wall like a malignant growth.

When I first began to study extrauterine pregnancy, which was before our present ideas concerning the implantation of the ovum were established, I was very much interested to find that in all of the early cases the ovum lay entirely outside the lumen of the tube. At that time we believed that implantation occurred on the surface and the egg became gradually walled off from the lumen by the upward growth of the decidua reflexa. We were puzzled how the ovum came to lay outside of the lumen of the tube. In many instances we attempted to explain it by assuming that there had been diverticula from the lumen, which extended a varying distance out into its wall, and believed that the fertilized ovum had entered one of them, had been arrested at its distal end and there undergone further development. Undoubtedly, this sometimes occurs, but even in such cases the egg at the time of implantation burrows down into the tissue just as in normal uterine pregnancy.

When we come to study the serotina basalis, we find, as Dr. Litzenberg has described, the great mass of the tissue made up of the fetal cells with very few of the decidual cells scattered among them. In unruptured tubal pregnancy, the egg is always separated from the lumen of the tube by a capsule, the so-called pseudo-capsularis, in which we get even fewer decidual cells than in the basalis. As the trophoblast proliferates about the ovum it causes the same destruction as in the basalis, and as the capsule is as a rule thinner than the walls of the tube, rupture is more likely to occur through the former than through the latter and we then have a satisfactory explanation for the more common occurrence of tubal abortion than of tubal rupture.

Indeed, I think that one of the very interesting things in connection with the history of extrauterine pregnancy is the very remarkable change which has taken place in our views concerning the relative frequency of rupture and abortion. Twenty years ago the former was considered the almost universal outcome and the latter as a pathological curiosity. But now we have come to believe that abortion occurs much more commonly than rupture, particularly when the ovum is implanted anywhere except in the isthmic portion of the tube.

Concerning the hemorrhage to which Dr. Litzenberg referred, we get very much the same conditions in tubal as in uterine pregnancy and the changes which he demonstrated in many of his specimens are identical with those which occur in many cases of uterine abortion before the egg has become entirely separated from its attachment. Consequently, I think that the occurrence of hemorrhage either within the capsule, that is, around the periphery of the egg or outside of it, are conditions which are common to both uterine and extrauterine pregnancy.

DR. ROBERT T. FRANK, NEW YORK CITY.—I will really confess that I was not able to follow Dr. Litzenberg in his demonstration. His sections were longitudinal. I have been in the habit of cutting these sections transversely. I see no particular advantage, after having looked at his sections, in the longitudinal method of cutting, because there are only a few of them that are useful and these are the ones which give us a good general survey.

As to the comparison of tubal with intrauterine pregnancy, I think there are absolutely no differences except such as can be accounted for by purely mechanical factors. Decidua in the tube lacks in thickness and varies in gross composition from that in the uterus. The tubal musculature and connective tissue do not respond by rapid and per-

manent hyperplasia and hypertrophy to the stimulus of pregnancy as the uterus does. The uterus does this even in tubal pregnancy, rapidly enlarging and forming a perfect decidua.

The erosive action of the ovum destroys the decidua in the neighborhood of the ovum and we see it to greater advantage outside of the ovular body.

Tubal abortion is a misnomer because it is not an abortion, but an outgrowth into the lumen of the tube. This is purely mechanical.

As to physiologic conditions, I recall a statement made many years ago by a member of this Society (Dr. Webster) that nidation can only take place in Müllerian tissue. The truth of this statement has become more definitely proved in the last year or so, particularly under the influence of work done by Dr. Cullen, another member of this Society, who has pointed out that uterine glandular structures can be found scattered in places in the ovary, on the surface of the uterus, in the umbilicus and in the round ligament.

As far as the hemorrhage of tubal pregnancy is concerned, I think the sole differences between extra- and intrauterine nidation can be explained upon purely mechanical grounds.

Dr. Smith has covered the ground so fully in his paper that all I can do is to bring to your attention several personal experiences. These cases can be divided into two types. In one type the intraperitoneal hemorrhage is of unknown origin. When I say this I lay myself open to criticism, but I can say to you that in three cases I have been unable to find the cause of the hemorrhage. In two of them I removed the uterus. One was a fibroid with peritoneal tuberculosis. I found a small tear in a vein over the fibroid. Examination showed a fresh tear and whether it was made in the hurry of exposure of operation I cannot tell. The patient recovered.

The second case was one in which I found an enormous quantity of blood in the abdominal cavity. The patient died three days later. At autopsy I injected colored fluid into the vascular system and was unable to find an exit for the bleeding.

Another case was one in which I had made a diagnosis of two months' pregnancy with twisted pedicle of an ovarian cyst. I was called several hours later by the doctor who said the patient had a ruptured ectopic pregnancy. I found a two months' pregnant uterus and twisted ovarian cyst with the pedicle torn completely off during transport, the bleeding coming from the torn ovarian artery.

The last case was one in which a pelvic mass was discovered. I aspirated and obtained pure blood. I at once opened the abdomen and encountered a terrific hemorrhage, which was practically uncontrollable except by compression of the aorta. The woman died. At autopsy the condition found was an ectopic chorioepithelioma; the pelvic tissues, including the sacro-uterine ligament, having been eroded. An aneurysmal mass formed by all the vessels in the neighborhood embedded in placenta-like tissue formed the source of the hemorrhage.

DR. BENJAMIN P. WATSON, TORONTO, CANADA.—I do not think it is advisable to carry the nomenclature of intrauterine pregnancy into that of extrauterine pregnancy, especially with regard to the terms basalis and capsularis. As Dr. Williams pointed out, the ovum implants itself in the tube by burrowing into the wall. In early tubal pregnancy, such as we saw in the demonstration of Dr. Litzenberg, there is no possibility of saying, which is basalis and which is capsularis. These are young ova, the oldest about six weeks.

With regard to the distinction between rupture and abortion, to my mind they are essentially the same thing. One cannot have tubal abortion without a previous tubal rupture. In cases of so-called rupture, it takes place in the peritoneal aspect, but the ovum cannot get into the tube until it ruptures into the lumen of the tube from its position in the tube wall. There has been too great a distinction made between rupture and so-called tubal abortion. They are essentially the same thing. In both cases the ovum ruptures through the tube wall, through the peritoneal aspect, or through the mucous membrane into the lumen.

DR. DICKINSON.—Clinically there is a difference.

DR. WATSON.—*Yes, clinically, there is a difference. When rupture occurs in the lumen,* the hemorrhage is small and the symptoms less acute; but so far as the pathology goes, they are essentially the same.

DR. JAMES E. KING, BUFFALO, NEW YORK.—I desire to report a case of abdominal hemorrhage from a large fibroid, which belongs in the group of cases described by Dr. Smith. The patient was a spinster, thirty-eight years of age, who had a fibroid the size of an adult head, and a femoral hernia of the left side. In the early morning hours she was seized with severe pain in the abdomen associated with vomiting. She noticed the femoral hernia had descended and was giving her pain. The family physician who was called regarded it as an intestinal attack without attaching any importance to the fact that her hernia was out. I was asked to see her in the afternoon. At this time the hernia seemed to be a factor in her case, as I found on trying to replace the hernia it did not go back. I was also struck with the peculiar doughy feel which the mass presented. We took her to the hospital and operated and in opening the hernial sac found it contained a clot with some free blood around it. The abdomen was opened through a transverse incision and a fibroid the size of an adult head was found. On the fundus and anterior surface was a clot of blood, to which was loosely adherent a portion of the omentum. Upon releasing the omentum a very considerable hemorrhage took place from a ruptured vein. The abdomen was filled with blood as one would find in early rupture or tubal abortion. The tumor was removed and upon examination I found no particular reason for the ruptured vein except that in a part of the tumor there was considerable edema and cystic change which I presume caused rapid growth and stretched the vein which lay across the surface of the tumor.

DR. LITZENBERG (closing the discussion on his part).—Dr. Williams will have to take my word for the accuracy of the demonstration because I only showed one slide, but the demonstration was the result of studying 200 consecutive slides to prove the point.

As to the hemorrhage in extrauterine pregnancy and the hemorrhage in the uterus, I tried to make clear that in so far as implantation was concerned, the implantation in the tube and uterus is identical. The differences are anatomical and histological. In the tube there is very little stroma, very little decidua, there is very little tube wall, therefore perforation is easy.

Dr. Frank says there is no advantage of longitudinal sections over the transverse or cross sections. My reasons for longitudinal sections is that in making them I had only 600 slides of each tube, whereas in the cross sections I would have 2000, and believed that I could study the 600 sections more readily than 2000, if I wanted to study the whole tube.

DR. SMITH (closing the discussion).—I have no doubt many of you have seen instances in which these hemorrhages have occurred, but the cases have not been reported. In cases where hemorrhage has occurred intraperitoneally, from fibroid tumors, oftentimes it has been difficult to find the source of the hemorrhage for reasons which are apparent. The tumors are large, the number of blood vessels is large, and oftentimes they are not bleeding at the time the patient is operated, and it is impossible to tell exactly where the hemorrhage came from. The point to be borne in mind is the possibility of this accident in cases of fibroid tumors.

Symposium on Sterility

DR. CHARLES G. CHILD, JR., of New York, read a paper on **Sterility in the Female with a Report of Operative Cures.** (For original article see page 248.)

DR. ROBERT L. DICKINSON, of New York, presented a paper entitled **Artificial Impregnation: Essays in Tubal Insemination.** (For original article see page 255.)

DISCUSSION

DR. EDWARD REYNOLDS, BOSTON.—I think Dr. Child is to be congratulated on his showing of operative work in tubal sterility. Seven successes is a large number for any one operation. He did not tell us what the total number of operations was. We may assume that it came from a large series, because it is the universal experience that the percentage of successes in opening closed tubes is small. To have gotten as many he must have done creditable work.

My own experience is that tubal cases are very unsatisfactory for operation and few successes are obtained. On the other hand, my experience is that cases in which the trouble is in the ovaries are extremely favorable. I am having records of my cases looked over and I hope in the near future to be able to present the end results of my series. I am able to present a good percentage of successes after conservative operation on the ovaries wherever the tubes were in good condition. Where one tube presents a mild salpingitis, a closed tube without much change, while the other remains normal, the woman is invariably sterile. Examination of the secretions will show that there is drainage from the affected tube into the uterus and this destroys the spermatozoa. In practice, if you find on operation that one tube is normal and the other tube closed, complete removal of the injured tube, the closed tube, with exsection of its interstitial portions from the cornu, will almost invariably, in a very large percentage of cases result in immediate fertility if the husband is potent and healthy. Those are the only favorable tubal cases of which I know.

Artificial impregnation is a subject of interest but one of which I am rather skeptical. Dr. Dickinson has reported the cases of three women, with success in two of them. That is a higher percentage than is usually obtained and perhaps due to his method of injecting the tubes.

I would take issue with the statement that these results can be obtained better than by operative work. It is not a high percentage as compared with the other work. I do not believe it is free from risk. I have seen in the course of my experience a considerable number of women who had artificial impregnation attempted and a pretty large proportion of them had tubal trouble. I do not believe that artifical impregnation is altogether harmless.

Washing semen through the tubes impresses me as unphysiologic. I should want to see a large number of successes before I was ready to use it. In Nature semen never reaches the tubes. In natural impregnation postcoital examination shows that the nonliving seminal elements do not even enter the uterine body. The cervix is full of them. The spermatozoa and the spermatozoa only go higher by unaided motility. The use of artificial insemination promiscuously without careful isolation of these cases which are due largely to cervical obstacles, I believe to be thoroughly unscientific and not free from danger. It comes down, in short, to the general principle that the routine adoption of any procedure for a condition which is the result of multiple and varying causes is poor practice. When cases have been isolated as appropriate for artificial impregnation, that is another question.

DR. JOHN O. POLAK, BROOKLYN, NEW YORK.—I think the keynote was struck by Dr. Reynolds as he sat down and that is, individualization of the cases of sterility. It is remarkable in the study of these cases to see how many of the male elements are inefficient. In a study we made and presented to this society of 687 cases, there were 301

of these women who were free from inflammatory histories that could be considered as possibly becoming pregnant; that is, free from a definite gonorrheal or postabortal history. Out of this number of men to whom these women were married, it was found that 90 of the men could not impregnate the women because they were sterile.

An interesting point brought out by one of the speakers, Dr. Dickinson, I think, was that they seemed sterile today and nonsterile tomorrow. I have had a number of these cases where reports have come in of men who were sterile and yet with little treatment the women become pregnant. These men may have lived with their wives for two or three years without any pregnancy having taken place. We would send them back and we would find them sterile again and after treatment they were able to produce another offspring.

Personally, our experience has been that the largest proportion of our cases of sterility are due to endocervicitis and some change in the secretion at the cervix. Here again, it is remarkable how the cervical secretion will change in the same woman. Women will go for periods of eight or ten years sterile, yet with the simple application to the cervix of such remedies as iodine and glycerine, they promptly become pregnant after treatment. There is no question in our minds that endocervicitis is a great factor.

I congratulate Dr. Child on his report. I have done 100 salpingostomies and only one woman has had three children from a resected tube. I have had seven ectopics as a result of my salpingostomies, which is interesting, and probably due to a defective procedure.

In regard to Dr. Dickinson's proposition, I feel very much as Dr. Reynolds does. I should like to know the cause of the sterility and would like to be reasonably sure before injecting semen into the uterus. I have tried it several times and I have obtained a reaction because I made such a bad selection of cases.

DR. ISADOR C. RUBIN, NEW YORK CITY (by invitation).—It would be well to know the total number of cases Dr. Child operated on for tubal occlusion and especially those in which he had no success.

The value of a test other than surgical to determine whether tubes are occluded or not can be illustrated in two cases in my experience. One occurred in my practice a number of years ago. A woman had been married three years and was sterile. I found a slight thickening on either side of the uterus. I went over the possibilities with this patient, tried all tests, found her husband absolutely potent, and decided I would give her the benefit of a tracheloplastic operation. She remained sterile. A year and a half later I heard indirectly from a colleague that she had been "butchered" by the operation; that is, that was the conclusion she came to following the consultation with a certain gynecologist, and she visited many others for relief of her sterility. She was then told that the cause of her sterility was the torn cervix; also that she had definitely diseased tubes and ovaries due to infection resulting from my operation. It was very disagreeable naturally to hear these things about an innocent operation. If it had only been possible for me to have her consent to a laparotomy at the same time that I did the Pozzi operation or could have employed some method whereby I could determine whether the tubes were patent or not, I would be in a better position to defend myself.

The second case I had three weeks ago in the ward at Mt. Sinai Hospital that well illustrates the value of such a diagnostic method. The patient had been married three years and was sterile. She had been examined by the staff and a slight thickening on one side was made out. Four days before my examination of this patient she had had a curettage and stem pessary insertion calculated to relieve her sterility. I removed the stem pessary and introduced oxygen into the uterus and found the tubes absolutely closed. We did a laparotomy the same day and found bilateral hydrosalpinx. Both tubes were slightly adherent but not very much distended, the walls being flaccid, accounting for the practically negative physical examination. This case was typical of numerous cases in which the same or similar procedures are done to cure sterility and yet the cause of the difficulty is not in the cervical canal but rather higher up in the tubes. The method of intrauterine inflation with oxygen to determine patency or occlusion of the Fallopian

tubes by establishing a pneumoperitoneum or failing to establish a pneumoperitoneum, affords the indication for the type operation that should be done. So far I have tried this method in 100 cases, that is from November 3, 1919, to date, and have found it absolutely safe, well tolerated by the patient, and reliable for the data for which the method was intended.

With reference to Dr. Dickinson's paper, there is no doubt that his results are most encouraging. I was especially interested in his observation that the uterus does not tolerate fluids like collargol, thorium and silver. I found this to be the case in my early experiments. Oxygen, however, is very well tolerated up to a certain point. These women complain of slight pain from the intrauterine pressure and distention varying with the individual. The pressure ranges between 50 and 70 mm. in the average patent case. When the tubes are occluded the pressure rises to 210, 220 or more. I do not recommend carrying the pressure beyond 200. Cases in which we had an opportunity to control later by laparotomy, the tubes where found closed where the pressure was 200.

DR. GEORGE GELLHORN, ST. LOUIS, MISSOURI.—Nine years ago I presented a paper on salpingostomy and at that time I reported the case of a woman who had conceived. She has had a second child since. Two other cases terminated with miscarriages. This, of course, had nothing to do with the operation. I have done in all about 40 salpingostomies, never solely for the purpose of opening tubes, but only when I found the tubes occluded in the course of a laparotomy. The number of operations was further cut down by the fact that I excluded all cases of inflammatory origin. The condition of the tube, more particularly the thickening of the walls, was the primary indication. In short, I limited the operation to cases where the occluding factor apparently came from without the tube rather than from within. This leaves practically only those cases of tubal occlusion for operation which have been caused by a previous appendicitis or ectopic pregnancy. If performed with such limitations, salpingostomy carries with it no dangers of any kind.

DR. N. SPROAT HEANEY, CHICAGO.—I would like to ask whether any particular time was observed in relation to the menstrual periods in these cases that were injected?

I have been considerably interested in the question of sterility because of the fact that in addition to being a gynecologist and obstetrician, I am a dairy farmer. Sterility in the dairy world is an important topic and is of the greatest economic importance at the present time.

Last fall we awakened to the fact that about one-half of our dairy herd was sterile. We called in a veterinarian and had the whole herd examined in order to separate the pregnant from the nonpregnant animals. The records of the nonpregnant animals were looked up and we found out when they had last conceived. In working with live stock we do not have the difficulty which Dr. Gellhorn mentioned and which makes the question of sterility in gynecology hard to become interested in. It takes such a large number of cases in order to reach any logical conclusion. In the dairy world we can follow each case to a logical conclusion. Examination of the bull showed that he had perfect semen. We found ten cows sterile. When a cow does not conceive after two services, something is the matter with her. Ordinarily such cows are sent to the butcher, but in a pure bred herd such a procedure represents a big sacrifice. One of these cows had an infantile uterus and after killing her, autopsy supported the clinical diagnosis. A second cow, a very valuable animal which had recently miscarried due to specific abortion, which miscarriage was followed by septicemia, showed upon examination a large swelling of the left tube and ovary. Examination produced a recurrence of fever and the cow became very sick. After killing this cow, we found she had an extensive tuboovarian abscess. All the remaining cows showed normal genitalia, except for extensive cervical erosions and high grade endocervicitis. These cases were all treated with applications of iodine to the cervical canal for periods of two to three months until satisfactory local conditions were obtained, before rebreeding. Six of these cows are either now pregnant or have been delivered. Two of these cows resisted treatment so that recently I operated upon

them. In each I did a dilatation of the cervix and an amputation, following the technic very closely that I use in the human subject. These cows have patent cervices and I feel confident that the operation will be successful.

DR. LEWIS S. MCMURTRY, LOUISVILLE, KENTUCKY.—The very basis of a satisfactory consideration of this subject is presented in the remark of Dr. Reynolds in the discussion, namely that the causes of sterility are so multiple and varied that there cannot be any scientific elucidation of the subject until we know more accurately the causes of sterility in both male and female. Let us examine some of the contraindications that we encounter. In the first place, it is common observation, more common years ago than at present, that in multiple lacerations of the neck of the uterus the operation of trachelorrhaphy, restoring the cervical canal, closing it, as it were, is very frequently followed by pregnancy when years have elapsed without conception. On the other hand, the most abused operation perhaps in gynecology, especially in the hands of the general practitioner, consists in forcible dilatation of the cervix uteri in an effort to cure sterility. Young women get married, go for two or three years without conceiving, go to a physician, and at once he proceeds to dilate the uterus and perhaps do a curettement at the same time, thinking she will as a result, conceive. That is a contradiction. We close the uterus in one case, and in another open it.

There is something about the internal secretions that has a great deal to do with sterility, although our knowledge of it is incomplete at the present time. Let me mention this one observation. In the mountains of Virgina, Kentucky and Tennessee, where people lead the simplest lives, and where they have the poorest obstetric attendance, where gynecologists are unknown, the families are large, six to twelve children in a family. Undoubtedly the frequency of infection is lessened by their isolation and simple mode of life.

DR. CHILD (closing the discussion on his part).—In answer to Dr. Boldt's question as to what I mean by resection of the ovaries, I will say that I had reference to those cases in which the ovaries are enlarged, studded with multiple cysts and the cortex thickened, so that the Graafian follicle could not rupture and discharge its ovum, as denoted by the absence of any scar of a previous rupture. In both of these cases one ovary was decapsulated, that is, the capsule was stripped off to get rid of the thickened covering, and in one case the other ovary was resected as well.

DR. DICKINSON (closing the discussion).—A method that works on the cow might work on the human individual that also has nine months' gestation. I wish a veterinarian had told us of the insemination of cattle because I understand that is a regular performance nowadays.

I can add two further cases to those spoken of, two of Dr. Carey's. Every additional case means that the procedure is worthy of a trial.

I should like to emphasize again the fact that semen may not enter the uterus true to form, and that we have to study the semen repeatedly.

Dr. Gellhorn raises the objection that you cannot examine the husband. You do not have to examine the husband. You can give the woman one of the rubber bulbs that are used for injecting various fluids into the urethra of the male. She takes that to bed with her, puts it under her pillow, and immediately after coitus she slips it into her vagina and thus has a specimen to bring to your office. By means of a test tube inserted into the introitus, a specimen may also be collected in a satisfactory manner.

Lastly, I wish to repeat that unless we begin to report these isolated cases we will never have any reliable data from which to draw conclusions.

DR. WILLIAM A. COVENTRY, Duluth, Minn. (by invitation) read a paper entitled **Lutein Cysts Accompanying Hydatiform Mole.** (For original article see page 266.)

DR. GEORGE GELLHORN, of St. Louis, Mo., read a paper, illustrated by lantern demonstration, entitled **A Method of Covering Raw Surfaces Upon the Uterus.** (For original article see page 262.)

DR. GEORGE GRAY WARD, JR., New York, N. Y., presented a lantern demonstration and case report entitled **The Operative Technic Employed in the Closure of an Extensive Vesico-Urethro-Vaginal Fistula.**

Dr. Ward in reporting this case referred to the unusual difficulties encountered owing to the loss of tissue from numerous previous futile attempts at repair and also directed attention to the fact that in such cases no set method of procedure can be depended upon to accomplish a result on account of the varying conditions met with in the individual case.

The patient, Mrs. M. S., aged twenty-nine, came under Dr. Ward's care at the Woman's Hospital, New York, in May, 1919, complaining of complete inability to hold the urine, following an instrumental delivery four years previously. She had been married eleven years and ten years ago when seven months pregnant, the instrumental labor resulted in a stillbirth. The laceration sustained at that time was repaired and the patient was in bed for a month. She then had seven spontaneous miscarriages during the following six years, with a curettage after each one. On December 8, 1915, when six and one-half months pregnant with twins, she went into labor; the membranes ruptured spontaneously, but an instrumental delivery was performed. Seven days later a continuous discharge of urine was noted. Two months after delivery an attempt was made to close the bladder fistula without result and in the next four years thirteen unsuccessful attempts were made by three different surgeons to bring about a closure. One of these operations was followed by an abdominal hysterectomy. Examination on admission to the hospital showed an edema of the external genitals and vagina, excoriations and numerous phosphatic deposits deeply embedded in the tissues. It was obviously impossible to attempt any operative procedure until the local conditions were improved. Rest in bed, daily hot douches, boroglyceride packs, zinc oxide ointment externally were employed and the internal administration of a prescription containing benzoic acid and sodium borate, which the late Dr. Thomas Addis Emmet had successfully used to render the urine acid and prevent the formation of phosphatic deposits. This course of preparatory treatment extended over a period of six weeks and the final attempt made to close the fistula on July 7, 1919. The technic was as follows:

The patient was placed face downward in Bozeman's position, the hips being well elevated. A large vaginal retractor was inserted and the perineum retracted upward. The ureters were then probed to establish their location, so as to avoid injury. A strip of tissue from ½ to ¾ inches wide was denuded with scissors completely around the edges of the cavity, extending across the site of the stump of the cervix which had been amputated, and also extending on the inner surface of the quadrangular flap at the site of the urethra. The cervical stump was next grasped with a bullet forceps and traction towards the urethra permitted ready approximation of the tissues lateral to the cervical stump. This threw the margins of the fistula into angles in the lateral fornices, so that the fistulous opening which was originally like the letter "O" now became shaped like the letter "U." The vesical edges of each angle were then closed by interrupted sutures of No. 1 tanned catgut. A second layer of interrupted sutures of silkworm gut was passed through the vaginal mucosa and the denudation of both sides, and the ends left long and tied together. The quadrangular flap at the side of the urethra was placed over the denuded stump of the cervix and sutured in a similar manner.

The result of this technic was a complete closure of the defect without tension.

A self-retaining catheter was inserted into the bladder through the urethral meatus and the bladder washed out with boric acid solution. The catheter was kept clean by daily irrigations with boric acid solution, was changed every four or five days, and retained for twelve days, at which time the sutures were also removed. The wound healed by primary union.

The result was most satisfactory for, although the patient has no vesical sphincter, she is able to retain her urine without leakage for a period of from two to four hours in the erect posture, and at night she can at times go considerably more than four hours.

DISCUSSION OF PAPERS OF DRS. GELLHORN AND WARD

DR. CHANNING W. BARRETT, CHICAGO.—In closing the extensive vesico-vaginal fistula reported, Dr. Ward has shown much ingenuity in this particular procedure. Previously he has laid quite a good deal of stress upon the advisability of getting away from the mere border of the fistula and treating it as a cystocele, starting in healthy tissue first. As there was no healthy tissue here to follow he has been thrown back upon this procedure described. In an extensive injury such as this patient had, inasmuch as there was no urethra, no sphincter vesicæ, I might have chosen the procedure of closing up the vaginal outlet and directing the urine into the rectum, as Dr. Peterson has shown may be done. He presented experimental work with fairly good results as regards sphincteric control, nonirritability of the rectum, absence of infection of the bladder and ureters from the rectum. However, if this result can be brought about with a patient able to go six or eight hours without urinating, I should say this method would have the advantage. We would hardly expect patients without sphincteric control to be able to go that length of time even in bed, and much less so when they are up and about. It is not always easy to get good union of the tissues throughout the whole area in extensive cases of this kind. No matter how much we admire the great brilliancy and patience of Dr. Marion Sims and honor him for the original work he did, we would hardly use his method extensively now. Success in dealing with fistula depends on the fact that instead of one membrane to deal with as a whole, we have two distinct membranes to be dealt with separately, namely, the bladder wall and the vaginal wall.

By mobilizing the bladder when it is possible, any sort of opening can be approximated; but it results only in diminution in the size of the bladder which is left. However, if we can get union the bladder will eventually distend.

Another great virtue is, instead of dealing with a closure like we have in the rectum, we can keep the bladder empty during the time of healing so that any strain upon the sutures can be taken off, but in spite of keeping it empty with a retention catheter, in a fairly weak place, a place that has been difficult to close, there may be a little leakage of urine that is apt to cause breaking down of the stitches at that point. I would lay stress in extensive cases, where such a weak place has been encountered, upon the advisability of making a temporary fistula anteriorly, opening the bladder and getting drainage anteriorly while healing is taking place. There is no difficulty in getting closure of an anterior opening, and by keeping the patient in Sim's position on the side opposite to the weak place, as the fistula is seldom in the median line, the suture can be kept almost absolutely clean from urine while healing takes place, and that facilitates closure in some cases.

Another point in regard to the closure. If we leave the vagina the natural length, and if the cervix opens separately from the bladder, it is usually not difficult to separate the bladder from the uterus instead of pulling the uterus down. You get the same amount of bladder tissue by leaving the uterus behind and pulling the bladder down, and by leaving the uterus behind you have a much better position of the uterus. A patient rather than have a vesicovaginal fistula would be willing to put up with a little disability of displacement, but we don't want the uterus down at the outlet if we can help it. That can be prevented by separating the bladder from the uterus and then almost any sort of opening can be closed. Some cases of vesicovaginal fistula are easy to close, while in others by reason of scar tissue we have great difficulty in getting at them.

The method described by Dr. Gellhorn for covering the uterus is ingenious. A great help in doing abdominal surgery is that there is no great tendency to adhesions unless there is some reason for adhesions to form. In reoperating cases we usually find that if the omentum has become greatly adherent to the uterus, or the bowel has become greatly adherent, it is because there has been reinfection in the stump by reason of not having taken out the angles of the uterus, but if it is necessary to cover any portion of the uterus, by this procedure it can be done. A suggestion comes to me that if there is any irritation of the bladder

at all, we can go a little higher and get the peritoneum a little farther from the abdominal wall.

DR. REUBEN PETERSON, ANN ARBOR, MICHIGAN.—At the suggestion of Dr. Gellhorn I have tried this procedure in a number of cases and am rather pleased with it. It has a limited field where it is desirable to cover the uterus. I would not be at all afraid of pregnancy supervening after this operation.

With regard to Dr. Ward's case, I cannot agree with Dr. Barrett as regards the advantages of utilizing the rectal sphincter as compared with the results obtained by Dr. Ward. I have done this operation in a number of instances and have worked up the literature. While the patient is able to hold her urine and is comfortable as compared with being wet all the time, she does not enjoy her condition. These women bitterly complain for obvious reasons. The operation should be reserved for those cases where the patients can be made comfortably by no other means.

Dr. Ward's technic is very interesting. It shows what can be done with these enormous fistulæ by dissecting away the bladder from the vaginal surface. However, I do not see why if the bladder sphincter has not been restored the patient does not continue to have a dribbling of the urine.

DR. WARD.—When she is on her feet the bladder is on a level and runs over, and at night when she is lying down she can go four hours without urinating.

DR. PETERSON (resuming).—I desire to add one thing to what I have already said. Dr. Barrett spoke of opening the bladder so as to get drainage and enabling these urethral fistulæ to heal. There is a better procedure than that if we utilize what the urologists are doing after prostatectomy. They drain the bladder from above by a system of vacuum bottles so that practically no urine escapes by the perineal route. If we will adopt the same method in the closure of vesico-vaginal fistulæ and urethral fistulæ, then these fistulæ will heal without any urine escaping from the urethral opening. I have cured one case of urethral fistula which many operations had failed to close, by the use of this technic. This to my mind is a valuable addition to the technic of the closure of urethral fistulæ, because infection always occurs where one has to drain the urethra or the bladder by means of the catheter.

DR. JAMES E. KING, BUFFALO, NEW YORK.—As Dr. Ward has said, these accidents are very much rarer than they used to be and I think I have had probably the average experience with the ordinary vesicovaginal fistulæ. It was not, however, until three weeks ago I encountered a case in which a family doctor (the patient living out of town about fifty miles) had applied forceps to this case and in using traction was greatly surprised to see the head suddenly emerge, with a fluid which he took to be some amniotic fluid. Upon examination after the delivery he discovered he had pulled from the base of the bladder the entire urethra. Upon the patient entering the hospital four months later, I found she had an opening at the point where the base of the bladder had been, which admitted a finger, the urethra being split entirely open. The problem which presented itself in this case was the question of getting the vesical sphincter together. In repairing it I found no indication of the sphincter of the bladder, but I attempted to bring the tissues together in such a way that if such a sphincter was there, I might approximate the ends. The urethra was then built up as well as possible. I then put in a drain through the vagina and sewed in the tube. I was surprised upon removing the drain through the artificial opening which I had made, to find my patient was able to retain her urine, and even now, if she is on her feet, she can go four or five hours without urinating. We have not decided to extend the capacity for holding urine, but she has already been reported as having passed 300 c.c. at one time.

An interesting point, as illustrated by Dr. Ward's case and the one I have recited, is this: Neither he nor I obtained a sphincter on which we could rely to control the bladder containing urine, but so far as my own experience goes and that of Dr. Ward, the sphincter of the bladder is not of such great importance in retaining urine as is the sphincter of the rectum in controlling the rectal contents.

DR. C. JEFF MILLER, NEW ORLEANS, LA.—There are a few salient points, regarding the technic of closing vesicovaginal fistulæ, that are fundamental, and must be kept in mind,

whether the fistula is a small, uncomplicated injury, or a large opening involving the urethral area, or urethra.

The first, and most important, is the necessity of dealing with the bladder as an independent organ. The cause of the majority of failures rests in the scar tissue of the vaginal wall, which presents so much tension, that the sutures slough. The anterior vaginal plate stretches between fixed points of the pelvis, and permits of only a minor degree of adjustment; therefore the vaginal plate must be freely incised, the release of the bladder wall accomplished by dissecting from the normal area into the scar tissue, and freed sufficiently in every direction to allow the bladder opening to be inverted and sutured without tension.

Failure to appreciate the necessity of this wide separation, especially when the opening is held close to the bony structures, spells disaster in many cases. In four very extensive fistulæ, I have performed a combined vaginal and abdominal operation. Separation was first carried out as far as possible through the vagina, then completed through an abdominal incision, the opening being closed per vaginam. Two of these cases were openings closely attached behind the symphysis, and presenting extensive infiltration. In another case, where practically the entire bladder base was destroyed, it was comparatively simple to close it by the combined vaginoabdominal method, and the result was especially satisfactory. The bladder capacity was reduced to two ounces for a few weeks, but eventually accommodated itself to hold eight ounces.

Another point that I wish to emphasize is the importance of careful dissection and preservation of structures when dealing with fistulæ involving the urethra. In two bad cases of this type, recently operated upon, in which I despaired of sphincteric control, the function was perfect. We cannot identify the sphincter fibers in any dissection, but by carefully approximating the urethral structures, we are frequently most agreeably surprised at the perfect results. Closing large fistulæ, by using the uterus as a plug, must be resorted to occasionally, but subsequent complications are frequent, and the procedure should be reserved only for exceptional cases.

DR. J. WESLEY BOVÉE, WASHINGTON, D. C.—As regards the ingenious operation devised by Dr. Gellhorn, I agree with Dr. Peterson that it has a small sphere of usefulness. In the large proportion of cases of Neisserian infection of the uterus and appendages, requiring the removal of the Fallopian tubes. we usually decide to remove most of the uterine mucosa. which will include most of the uterine body, and in the presence of infection we would expect adhesions to the posterior wall. In such a case as that in which I find Neisserian infection outside the uterus I resort to vaginal drainage by paraffin-stearine gauze brought over the raw surfaces and left a sufficient length of time to allow endothelization to take place.

As to the fistula work, it is very important. Some of these cases of fistulæ are very difficult and tedious to handle. I have seen cases in which I have never got around to do the operation of closing the opening between the vagina and bladder because of the condition of the urine and the condition of the bladder itself. I know one woman in whose case I tried for three periods of four months each to get rid of alkaline urine. When she first came in I removed a calculus that nearly plugged a large opening which she had in the septum. I built a urethra for her easily. There was no evidence apparent that she had ever had a urethra. I passed a bistoury from the pubic arch to the interior of the bladder, puncturing the bladder mucosa. I then made a vaginal flap and drew it forward from the bladder through the canal I made with the bistoury, sutured the end of it near the pubic arch and secured for her a urethra. I see her occasionally and bring her into the hospital, but I have not decided it is safe yet, on account of the condition of the bladder, to close the fistulous opening.

I am quite in accord with the idea Dr. Peterson has given us as to suprapubic drainage in these cases, particularly if we have surgical work to do on the sphincteric muscle of the bladder and on the urethra, not so much where these are intact, in operating on the fistula.

DR. WARD (closing the discussion).—In this particular case, in a woman 29 years of age and married, the procedure suggested by Dr. Barrett of colpocleisis would have been out of the question. She never would have consented to it.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

Five Year Radium Cures of Cervical Cancer

(Critical Review of Recent Literature)

BY FRED. J. TAUSSIG, M.D., F.A.C.S., ST. LOUIS, MO.

Sufficient time has now elapsed to form a tentative estimate of the value of radium as a curative agent in cervical cancer. As far back as 1914 a few cases were reported by Cheron and Duval,[1] and Wickham and Degrais,[2] that had remained cured for four years, but no systematic treatment on a large scale was begun until the years 1913-1915. Those were the times when radium enthusiasm was at its height and we can now determine the final outcome of the cases treated during that period. That a large proportion of these reports emanate from Germany is to be explained chiefly on two grounds: The one is that German cities and universities purchased large quantities of radium and mesothorium for their clinics and hospitals in 1913; the other is that the German Gynecological Society at its meeting at Halle in 1913 decided to try out on a large scale the use of radium therapy in operable as well as inoperable cancer of the uterus and to report at the meeting two years later. The war came and not unfortunately interfered with premature reports of these results. A five year period has now elapsed and we can begin to form an estimate of the percentage of permanent cures obtained. Experience with the results of the radical hysterectomy of Wertheim already showed conclusively that it was necessary to wait five years before counting a case as cured. Even after that time an occasional recurrence would be found, but this was so exceptional that it did not materially influence the final percentages. The absolute cures by this radical hysterectomy averaged around 20 per cent, that is to say, one out of every five persons afflicted with cervical cancer could be saved by operation. It has been claimed by von Seuffert[3] that recurrences following radium treatment do not appear later than three years after complete retrogression of the tumor, but the reports of Schaefer,[4] Heyman[5] and others thoroughly disproved this. So we had better hold to the five-year period as the final test of treatment. It cannot be denied, however, that the percentage of late recurrences is distinctly less after radium treatment than after operation. In this review, therefore, I have excluded those cases that had not been under observation a sufficient length of time. I also deducted all cancers of the uterine body, the urethra, and the vagina, since they demand separate consideration.

France, where radium was first discovered and used for the treatment of cancer, has produced no systematic study of five-year results. Degrais,[6] who was associated with Wickham, did not, in his recent report, give detailed statistics. His experience dates back to 1908, but his article only contains general observations as to treatment. The supply of radium in France has

always been limited, and the interest has centered more in dermatology than in gynecology.

From England we have the yearly reports of the Radium Institute, but there is no analysis of five year results, neither has any group of gynecologists specially interested itself in this form of treatment until recently.

Spain has produced in Recasens[7] a radium enthusiast whose experience extends over a long period. One hundred twenty-six of his cases date back to 1914-15 and thirty-two of them (25.4 per cent) are at the present time free of recurrence. He was one of the first to include operable as well as inoperable cases in his treatments.

In Sweden the institute at Stockholm purchased radium in 1913 and Heyman[5] has published carefully analyzed reports in 1917 and again in 1920 of the results of treatment in cervical cancer. Hansen[8] also has written concerning the work of this institute. Of the cases dating back to 1914-15, 66 patients showed 18 cures of more than five years' duration. This high percentage of 27.3 per cent curability may be accounted for in part by a better technic, for Heyman emphasized the importance of a high intracervical application, heavy dosage, and a series of three treatments, all within five weeks' time. Most other clinics at that time gave more frequent lighter treatments at longer intervals and made vaginal applications. This points to the possibility of a considerable increase in the percentage of cures under improved radium technic in other clinics.

From Switzerland we have a report, though a somewhat meager one, from Hussy,[9] of Basel, who found 3 cures out of 12 cases of cervical cancer treated longer than four years ago.

Germany furnishes the bulk of the evidence upon this subject and most of the reports appear in the transactions of the meeting of the German Gynecological Society held in Berlin, May 26-29, 1920. They include Schaefer[4] (Berlin) 282 cases; von Seuffert[3] (Munich) 205 cases; Warnekros[10] (Berlin) 173 cases; Flatau[11] (Dresden) 25 cases; Schweitzer[12] (Leipzig) 49 cases; Weinbrenner[13] (Magdeburg) 51 cases; Gieseke[14] (Kiel) 39 cases; Baisch[15] (Stuttgart) 42 cases; and Dietrich[16] (Goettingen) 26 cases. From some clinics such as Eckelt[17] (Frankfurt), Eijnar[18] (Heidelberg), and Adler[19] (Vienna) the reports available are too vague to be included in this summary. The accompanying table (Table I) gives the essentials of these reports. The percentages of permanent cures it will be seen range from 10 to 20 per cent.

American literature thus far contributes but little to this subject. Kelly[20] as far back as 1916 reported two cures, one of seven and one of five years' duration, but unfortunately he has not yet tabulated his five-year results, although he had treated 327 cases of uterine and vaginal cancer previous to April, 1916. Bailey[21] from the General Memorial Hospital of New York presented in 1919 a review of 49 cases of cervical cancer treated in 1915 with but 4 persons free of recurrence. Only one operable case was included in this list and his technic during that period was far inferior to that now employed, which accounts for his low percentage of curability (8 per cent). The greatest enthusiast for radium treatment of cervical cancer is Ransahoff,[22] who reports 3 cures out of 30 cases treated five years ago. Three additional cases of this series are free of recurrence two to four years after treatment. Schmitz[23] reports 3 cases of cervical cancer treated with radium alone, cured for longer than 3 years, but he does not state what proportion of his 208 cases were treated during these first three years, hence no percentage can be figured out. Clark[24] recently discussed the outcome of 209 cases treated between 1914-19. Practically all were inoperable. Out of 26 cervical cancers of over four years' duration, 3 were living and free of recurrence.

To obtain the absolute percentage of cures after radium treatment we must observe the same rigid rules that were laid down regarding the Wertheir,

operation. All cases that present themselves for treatment, whether treatment is given or not, must be included. No deductions can be allowed for those that do not follow up treatment after one application has been made, for especially in comparing radium treatment with operation it cannot be denied that the latter has a distinct advantage in that all the work is done at one time, whereas radium treatment often extends over a considerable period during which the patient may for one reason or another fail to return, thus interfering with the final outcome. Neither can we deduct intercurrent deaths during the five-year period, even where death was proved by autopsy to be due to other causes, for no autopsy is so perfect that it can detect microscopic remnants of cancer in lymph gland or connective tissue. All complete or partial hysterectomies, whether done before or after radiation, must be separately considered, and, of course, we must limit discussion solely to primary cancer of the cervix. I do not think it advisable, however, for the present to distinguish between cases where radium alone was used and those where x-ray was given in addition. With such limitations I have been able to tabulate 1114 cases treated five or more years ago, of whom 223 are alive and free of recurrence. This means a curability of exactly 20 per cent, practically identical with the average results obtained by the radical hysterectomy.

We must bear in mind however when comparing the results of radium with those of operation, that the 20 to 25 per cent absolute curability by the radical operation comes after an experience of 15 to 20 years with this procedure during which time many improvements were devised to lower the primary mortality and decrease the likelihood of recurrence. The first results of Wertheim and others did not yield more than about 12 per cent absolute curability. A similar increase in cures is reasonably to be expected as a result of improved technic in radium treatment. In fact this has already been apparently obtained in two clinics which employed as early as 1914-15 methods of treatment similar to those now generally accepted as the best. It would seem therefore reasonably certain that in the future, if *all* cases of cervical cancer are included, radium alone will be found to cure more cases than operation alone.

The crux of the matter, however, as I see it, lies not in a comparison of *all* cases treated, but in a comparison of the *operable cases* alone. Not even the greatest skeptic can now deny that radium can effect a cure where operation is impossible. The percentages of cures in inoperable cancer of the cervix obtained in the larger clinics are: Schaefer 5.5 per cent, Warnekros 6 per cent, von Seuffert 8 per cent. Some variation will doubtless be found as to the limits of operability, but in general this has been fairly well established by past experiences. If these extreme limits, including the so-called borderline cases as well as the readily operable ones, be accepted, in other words those in which the expert surgeon would do a hysterectomy, we have a sound basis for comparative statistics. It seems strange that von Seuffert in his detailed and otherwise logical analysis, comparing radium with operation, included on the side of radium the nine radium cures obtained in his inoperable cases. We must hereafter emphasize that we are primarily concerned at the present time with the results obtained in *operable* cancer of the cervix. The vital question is whether in this group operation should be superseded by radium. Comparative statistics must allow no deductions. They must include merely the total five-year cures in all the operable cases, whether subjected to treatment or not, that come to the clinic during a given period.

As seen in the accompanying table eight writers gave sufficient details to permit the calculation of the percentage of operable cases of cervical cancer cured by radium alone. A total of 415 yielded 131 cures, or 31.5 per cent. This is considerably less than the 45 to 50 per cent cures obtained in the treat-

583	SMS00583	American journal of medicine		29	1960	English	11.12.09
584	SMS00584	The american journal of obstetrics and disease of women and childern		24	1891	English	11.12.09
585	SMS00585	The american journal of obstetrics and gynecology	1(1)		1920	English	11.12.09
586	SMS00586	The american journal of obstetrics and gynecology		2	1921	English	11.12.09
587	SMS00587	The american journal of obstetrics and gynecology		3	1922	English	11.12.09
588	SMS00588	The american journal of obstetrics and gynecology		4	1922	English	11.12.09
589	SMS00589	The american journal of obstetrics and gynecology		5	1923	English	11.12.09
590	SMS00590	The american journal of obstetrics and gynecology		6	1923	English	11.12.09
591	SMS00591	The american journal of obstetrics and gynecology		7	1924	English	11.12.09
592	SMS00592	The american journal of obstetrics and gynecology		8	1924	English	11.12.09
593	SMS00593	The american journal of obstetrics and gynecology		9	1925	English	11.12.09
594	SMS00594	The american journal of obstetrics and gynecology		11	1926	English	11.12.09
595	SMS00595	The american journal of obstetrics and gynecology		12	1926	English	11.12.09
596	SMS00596	The american journal of obstetrics and gynecology		13	1927	English	11.12.09
597	SMS00597	The american journal of obstetrics and gynecology		14	1927	English	11.12.09
598	SMS00598	The american journal of obstetrics and gynecology		15	1928	English	11.12.09
599	SMS00599	The american journal of obstetrics and gynecology		16	1928	English	11.12.09
600	SMS00600	The american journal of obstetrics and gynecology		17	1929	English	11.12.09
601	SMS00601	The american journal of obstetrics and gynecology		18	1929	English	11.12.09
602	SMS00602	The american journal of obstetrics and gynecology		19	1930	English	11.12.09
603	SMS00603	The american journal of obstetrics and gynecology		20	1930	English	11.12.09
604	SMS00604	The american journal of obstetrics and gynecology		21	1931	English	11.12.09
605	SMS00605	The american journal of obstetrics and gynecology		22	1931	English	11.12.09
606	SMS00606	The american journal of obstetrics and gynecology		23	1932	English	11.12.09
607	SMS00607	The american journal of obstetrics and gynecology		24	1932	English	11.12.09
608	SMS00608	The american journal of obstetrics and gynecology		25	1933	English	11.12.09
609	SMS00609	The american journal of obstetrics and gynecology		26	1933	English	11.12.09
610	SMS00610	The american journal of obstetrics and gynecology		27	1934	English	11.12.09
611	SMS00611	The american journal of obstetrics and gynecology		28	1934	English	11.12.09
612	SMS00612	The american journal of obstetrics and gynecology		29	1935	English	11.12.09
613	SMS00613	The american journal of obstetrics and gynecology		30	1935	English	11.12.09
614	SMS00614	The american journal of obstetrics and gynecology		31	1936	English	11.12.09